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6 January 1978

TRANSLATIONS ON ENVIRONMENTAL QUALITY

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PROTECTION OF VANISHING WILDLIFE SPECIES

Kabul THE KABUL TIMES in English 1 Nov 77 pp 2, 4

[Article by Arun Bhattacharjee]

[Text]

"... when within two miles of the Ab-i-Estada... something red as the rose of dawn kept skewing and vanishing between the sky and water... When quite close we found these were flamingos... not 10,000 or 20,000 but ~~innumerable~~"-- Babur the Great (1483--1530).

Five hundred years ago, Ab-i-Estada's flamingo population could very well have exceeded the Mughul emperor's rough calculation. But today, the "bird of flame" is a threatened species, and along with the famous Marco Polo sheep and the Karakoram ibex, the object of frantic preservation efforts.

Years of indiscriminate hunting and destruction of natural habitat have reduced Afghanistan into an almost birdless country. During a four-hour drive on the salang road from this capital to the Soviet border,

this reporter was struck by the almost total absence of birds along the way.

But the pillage of the wildlife may be ending. With help of the United Nations Development Program (UNDP), the Food and Agricultural Organisation (FAO) and the World Wildlife Fund, the Government has adopted a scientific approach to protect vanishing wildlife species and strike a balance between preservation and the need for foreign exchange.

Under FAO and UNDP guidance, the Afghanistan Tourist Organisation (ATO) has set up planned tourist camps for controlled hunting of the Marco Polo sheep and the ibex.

Keeping the desired level of population of the Marco Polo sheep and the ibex is a vital ingredient of the Government's wildlife preservation program. In the past, many young sheep and ibex died owing to shortage

of forage. Grazing by nomads in the high Pamir plateau, known as the top of the world and home of the Marco Polo sheep and the ibex has been banned.

The Government allows the killing of only 10 Marco Polo sheep and five ibex annually in the Small Pamir area for which it derives roughly U.S. \$ 70,250.

A new FAO proposal seeks to open the Big Pamir area to hunting and extend the limit to 18 Marco Polo sheep and the ibex to 20.

The Afghanistan Tourist Organisation charges U.S. \$ 6,900 per Marco Polo sheep and U.S. \$250 per ibex. It was estimated that by increasing the price on ibex to U.S. \$1,000 the country would derive U.S. \$144,000 annually from both species.

Most moneyed hunters still prefer the Marco Polo sheep and Pamir ibex which are found only in Afghanistan.

Another threatened Afghan specie which needs careful preservation is the Bactrian deer (*Cervus elaphus bactrianus*). The rapid depletion of the Bactrian deer population came about when its natural habitat in the northern countries were destroyed by settlers. Natural calamities such as typhoons have also wrought havoc on the deer population so much so that within the Thakar study area, less than 60 animals are known to exist.

The first major preservation campaign in this area started a few years ago in the Ajar Valley in the Badkhan province which was declared as a deer sanctuary in 1974. The first survey of the Bactrian deer population was made in 1973 with funds provided by the World Wildlife Fund. The Government is also breeding the Bactrian deer in captivity in the Kabul zoo and the Forest Department hopes to introduce it to the Ajar Valley reserves.

A comprehensive study on the country's mammal species was done by wildlife expert Khushal Habibi, a biologist in the Directorate of Wildlife and National Parks in the Ministry of Agriculture.

According to Habibi, at one time, 10 cat species were found in Afghanistan. Of these, the Caspian tiger seems to have vanished totally. Within the last decade not a single Caspian tiger has been found in Afghanistan.

Habibi also says indiscriminate hunting and destruction of natural habitat have condemned the Afghan tiger to extinction. The tiger's old habitats have been taken over by the Bactrian deer.

With the rampant destruction of habitat, a number of jungle birds and waterfowl have also become endangered. Hunting has depleted the snow leopard population which are found in Pamir Plateau, the Nuristan, the alpine valleys of the forest and some parts of the Hindu Kush range.

With the destruction of large herds of spotted gazelle in the southern deserts and the decimation of the only odd-toed ungulate found only in Afghanistan—the onager—their main predator, the cheetah, has also become extinct.

Red fox and Blanford's fox, both considered as rarities, are still found. Eight species of martens are

found in Afghanistan but poaching for their valuable skins continues unabated.

The Wildlife Department claims that brown bear and black bear may still be found in the Hindu Kush, Nuristan and Spingher forests, but very few people have actually seen them. The wildlife department also claims that 32 species of flying mammals exist in Afghanistan but one would have to be extremely lucky to find one.

Recently, the Wildlife Department has discovered Dasht-e Nawar as a flamingo breeding ground situated 135 kilometers away from Ab-i-Estada.

With scientific and modern wildlife preservation techniques and strict Government control of flamingo hunting, Afghanistan could succeed in bringing back the "birds of flame" which Emperor Akbar saw some five centuries ago and make Afghanistan a paradise for bird watchers from all over the world.

## INDUSTRIAL EFFLUENTS KILLING FISH, COCKLES

### Fishermen Hit Twice

Kuala Lumpur NEW STRAITS TIMES in English 6 Oct 77 p 24

[Article by Christopher Butterworth]

[Text]

**FIRST** the fish died, now the cockles — the so-called new-found wealth — are following suit.

Fishermen of Kuala Juru, 20 miles from here, are fighting a grim but losing battle with pollution by factories discharging industrial waste.

"It's a matter of life and death," fisherman Salleh bin Hussein, 46, said. "If the cockles die, we are finished."

Encik Salleh, a father of five, first noticed the change about five days ago. Thousands of cockles along a 10-acre stretch near the mouth of the Juru river were dying.

"They were all lifeless or half-dead," he said. "I was shocked. They were almost ready for harvesting. I nearly cried."

Encik Salleh appeared dazed as he told his story to a group of pressmen who accompanied by officials of the Consumers Association of Penang, visited the scene this morning.

There are about 55 acres of cockles planted by Kuala Juru fishermen near the river mouth and in the sea further downstream.

The fishermen and their families numbering about 300 persons depend on cockles' culture for a living. They earn about \$300 a month.

Encik Salleh, who is also unit head of the Kuala Juru Fishermen's Co-operative, recalled that the fishermen first started rearing cockles in June last year after all their fish died. It was believed pollution was the cause of their death.

"It was difficult trying to make ends meet till we started to rear cockles with Majukan's aid."

But their joy seems to be short-lived.

The fishermen are now transferring what cockles are left to a 45-acre plot further out to sea.

## Action Needed Now

Kuala Lumpur NEW STRAITS TIMES in English 7 Oct 77 p 12

[Editorial]

[Text]

Near Klang, 10,000 inhabitants are affected and a thriving fishing and belacan industry has been killed by the effluent of one factory. In Kuala Kedah, 160 families have watched their padi wither and their ducks and fish farms die from chemical discharge. Similar stories have steadily multiplied as industrial development has intensified. Now Kuala Juru in Prai, a Majuikan success story, is dying too. The Juru saga began when the river and coastal fish died as pollution levels from factories in the Prai Industrial Estate mounted. But last July Majuikan sank a quarter million into a 70 acre cockle farming scheme in partnership with fishermens' co-operatives. This has been so successful that the capital investment was expected to be recouped within this year and reinvested in similar schemes along the Prai coast. This happy ending may now be aborted. Those groups most affected by industrial pollution — fishermen and riverine kampung dwellers — are those who can least afford the loss of income and cheap protein supply that the rivers have always given them.

For these reasons the gazetting of regulations this month to control effluent from palm oil factories is heartily welcome. But while the level of river pollution is escalating yearly and the plight of the fishermen is immediate, the pronouncements from the Ministry of Science, Technology and Environment are all couched in the future tense. The regulations will be implemented in stages up to 1981. The present inspectorate of 15 will be expanded. Regional control centres will be set up. Regulations controlling other types of pollutants — and it is chemicals that are killing the padi in Kuala Kedah and the cockles in Kuala Juru — will be gazetted soon. But how soon? While from the point of view of the economy as a whole the Ministry's caution in dealing with a key industry is appreciated, the plight of those affected must be given equal weight.

WATER POLLUTANTS INVESTIGATED

East Berlin BAUERN-ECHO in German 12/13 Nov 77 p 8

[Article by Heinrich Langmaack and Werner Winter, Institute for Water Management: "Experiments with Mice, Fish and Cyclops; 250 Substances Examined for Their Effect as Water Pollutants"]

[Text] Water pollutants are those substances which even in low concentrations have a poisonous (toxic) effect on warm-blooded animals or aquatic organisms, disrupt the self-cleaning process of bodies of water or have an adverse effect on the use of water for drinking or utility purposes. The basic prerequisite for practical and legislative water pollution control is precise knowledge about the characteristics and effect of water pollutants. The following article deals with this subject.

Industrial production gives off water pollutants, particularly the chemical industry. If water pollutants that derive from the production process as intermediate products, by-products or waste are not retained or broken down by industrial waste-water purifying plants, they get into our rivers and lakes along with the waste water. It is relatively easy to eliminate them, since they occur only at the place of production where appropriate countermeasures can be taken.

Elimination is substantially more difficult in the case of substances that are produced for use by the general public. Among these are pesticides and insecticides, detergents, mineral fertilizers containing nitrogen and phosphorus, and mineral oils. Products of this type can find their way into virtually all bodies of water.

If we are to eliminate or substantially reduce the burden on our environment that results from the use of such products, we must examine the possible effects on man and the rest of nature -- in

this case, water and its organisms -- and develop procedures and methods for eliminating these effects. The main concern here is the physical health of human beings. Saturation limits are being established for water pollutants, limits below which even lifelong intake produce no demonstrable harmful effects.

#### Experiments with Animals

Experiments are being conducted with warm-blooded animals in order to arrive at these saturation limits. The water pollutant being tested is "fed" in graduated concentrations to rats, mice or guinea pigs. The valid limit for humans can be derived using the results obtained.

One example is as follows: If rats are fed the active agent from a household dishwashing detergent in addition to their regular diet for a lengthy period, it is found that the animals can tolerate 140 mm per day, converted to 1 kg of animal weight. Taking into account a safety factor, the valid limit for humans is lower by at least one unit of 10. For a person weighing 70 kg, the saturation limit is found to be above 100mm per day. If a liter of water contained 10mm of this active agent, one could therefore consume 10 liters of water per day without having to fear damage to one's health. This high level is, however, virtually never reached even in polluted water.

#### Decomposition Rate Sought

The next point of interest is the effect of water pollutants on fish. The question that arises here is what is the maximum permissible quantity of water pollutants if damage in rivers, fish ponds, dams, and so forth is to be avoided. The research principle is analogous to that used with warm-blooded animals. Similarly, experiments are conducted with animals that fish feed on. The idea is to avoid having the edible fish survive the effect of water pollutants only to die later on because these water pollutants have killed all of the water fleas, cyclops, and so forth. The household dishwashing detergent -- as an example of a water pollutant -- that is not dangerous to humans has a considerably more toxic effect on fish than on human beings. Here the saturation limit is about 1mm per liter of water.

From the standpoint of water quality control, it is always important to find out whether the pollutants in bodies of water gradually decompose as a result of microbiological reaction. The higher and faster the rate of decomposition, the less danger is presented by a water pollutant. If, however, the micro-organisms present in the water are unsuccessful in breaking down the substance, this substance must be assessed very critically because it can pose

problems for the user if the water is used again. Our example of the household dishwashing detergent was found to be not dangerous since it has a relatively high and rapid rate of decomposition.

Regardless of the effect on man and animals as well as of the water's ability to break down a substance, it must be possible to eliminate the water pollutant by means of purifying waste water (sewage treatment plant) or natural water (waterworks).

#### Expansion Ahead

In conjunction with a number of our economy's other research institutions, a research collective made up of chemists, biologists, biochemists and toxicologists has done basic research in this field. Working meticulously, they examined 250 substances for their properties in water and for possibilities of removal. Among these substances were detergents, household dishwashing detergents, hydrocarbons, phenols, solvents and inorganic substances. The results were compiled in a water pollutants catalog which is to be expanded by an additional 150-250 entries at intervals of 2 or 3 years.

The effectiveness of this research was heightened by close cooperation with the Soviet Union. Both sides compared and exchanged numerous results.

#### Important Groundwork

The catalog of water pollutants has many uses as a reference work and as a practical handbook for use in the areas of water management, waste-water purification, water treatment and other economic sectors. Among other things, it establishes the natural sciences groundwork for legislative measures such as implementation of the second implementing regulation to the GDR Water Law.

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## HUNGARY

### GREATER INDIVIDUAL, PUBLIC EFFORT URGED TO PROTECT ENVIRONMENT

Budapest NEPSZAVA in Hungarian 15 Nov 77 p 3

[Article by Laszlo Magyar: "For the Cleanliness of Our Environment"]

[Text] Your town is pretty but unfortunately a little dirty.... Traveling in the cities of the country in the tourist season even 10 years ago one could hear this from foreigners, and this polite criticism can still be heard today. It means that there was no noticeable change in the cleanliness of our cities.

True, we could say that at least it is not worse--which is no mean feat because the quantity of garbage increases by some 5 percent annually in the cities. Budapest produces 2.6 million cubic meters per year: another Mt Gellert could be built from this volume. At the same time, as the cities grow, so do the green belts that have to be maintained. Still using Budapest as an example, the Capital Gardening Company has to maintain 12 million square meters of park surface, with some half a million trees....

Side-by-side with the growth of garbage mountains and green surfaces, the necessary material and machinery fleet grows, too. We should mention here that today we can direct 350 garbage trucks, 250 street cleaners and other tools and numerous trucks in the interest of cleanliness. What Vienna has not yet attained Budapest has succeeded; the Capital City Sanitation Office has, in 1976, extended dust-free refuse transportation to the whole city. In the past inhabitants of Budapest stored garbage on old pots and other unsuitable vessels.

We could rightfully ask that if we spend hundreds of millions, in fact, billions, for order, why are there still so many complaints? Why do the visiting foreigners keep saying, even today, that "your town is pretty but..."

Truly, not much detective work is needed to find the reason for this. Starting with the main reason: today's Hungarian citizen is more demanding than before and would like to live in a clean town--but somehow does not think that he has to contribute toward that goal. Therefore, as the complainants at the Gyor City Council tell us, they sweep downtown spanking clean at night in vain because as soon as the morning rush is on the refuse appears. This is true even in areas where there is a receptacle every 25-30 meters.

In this same town they tell us that the new developments, outside the city, are the same. Starting with apple core, people throw everything on the streets, even from upper-story windows. They also empty the contents of the cars' ashtrays on the streets.

A fall meeting of the Budapest Council of Trade Unions convinced us that the inhabitants of Budapest are not different from those of Gyor in this respect. We learned there that the people of the capital city caused 1 million forint damage in the first half of 1977 to road signs, chains and rails. Even today, vandalism is frequent: in one night in August several thousand forints' worth of flowers were torn out in People's Park. In general, several million forints' damage is done yearly to parks.

Unfortunately, experience shows that inhabitants of Budapest behave the same when they come in contact with the environment whether they are private citizens or employees of some enterprise. We start with the well-known fact that there are 30,000 road excavation orders every year in Budapest. On the torn roads and squares there is always innumerable refuse.

The building concerns like to carve out a larger part from the streets and parks than we think necessary for the task. (With respect, of course, to the small number of exceptions.) Not all of them excel in leaving cleanliness and order behind at the completion of the job.

Sales, and especially food store personnel deserve special mention. The surroundings and fronts of stores leave--to put it mildly--much to be desired. Alas, the authorities are unduly tolerant with the litterers. Gyor is one of the better places in this respect because about 100 people are prosecuted annually for littering.

True, let us not be partial, it is rather hard to prosecute because one needs witnesses and people have to be "caught in the act." The question arises: shouldn't we organize a network of public order and cleanliness policing corps with limited legal authority? There are some foreign cities that have this. We live in the age of specialization: if we accept that police-trained traffic experts organize orderly traffic, why should it not be natural to get expert supervision for public cleanliness?

The main improvement, of course, will not depend on this public orderliness--public cleanliness network that will hopefully be a reality some day but on all of us. It will depend on how we behave on the street.

There is an old saying: everyone should sweep in front of one's own house. The unions already started this "sweeping." Perhaps the most convincing proof of this is that the Budapest Council of Trade Unions--as already mentioned--at its early fall meeting, discussed the situation of the orderliness and public sanitation of the capital city and, in connection with this, arrived at a 31-point program of tasks for the trade unions. We emphasize that the points cover merely the trade unions.

An item on the list is future publicity of the problem at union schools, courses and workers' hostels. They will mount a traveling exhibit to popularize the cause. Together with the Patriotic People's Front they will assist the work of environment guards, and so on....

We hope for such determination on the part of other organizations, also. Then we will hear only seldom what we frequently hear now: "Your town is pretty, but..." All of us must realize that not only the flat, but also the street, the square, the park are ours, too.

All in all, we should not merely be more demanding, we should change ourselves a little, also.

10101

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BRAZIL

## EFFORTS MADE TO PRESERVE BASIN'S ENVIRONMENTAL QUALITY

Sao Paulo FOLHA DE SAO PAULO in Portuguese 28 Oct 77 p 28

[Article by Mauricio Cardoso]

[Text] At the conclusion of a meeting attended by 80 people--among them prefect Joao Hermann Neto and Americana and Capivari prefects Valdemar Tebaldi and Julio Forti Neto--an entity was established yesterday in Piracicaba whose principal mission is the protection of the Piracicaba Basin, now threatened with total destruction by the systematic discharge of industrial wastes and sewage into its rivers. The meeting, attended by councilmen and other persons interested in the protection of the river, took place in the Municipal Chamber auditorium. All the water and sewage departments in the area sent their representatives, and the PRODEBAP (Program for the Defense of the Piracicaba River) was established at the conclusion of the meeting.

Americana prefect Valdemar Tebaldi, Piracicaba prefect Joao Hermann Neto, Capivari prefect Julio Forti Neto, the representative of the water and sewer department of the Sao Pedro Municipality, Salgot Castillon, and the scientist representing the CENA (Center for Nuclear Energy Applied to Agriculture) from the "Luis de Queiros" Higher Institute of Agriculture, Nelson Silva, spoke at the meeting. Silva explained that the CETESB [Basic Sanitation Technological Center] "is not a supervisory organ, since it only fights pollution once the problem has been detected." The president of the organization with responsibility for the Paranapanema Basin's protection was also present at the meeting; he gave a brief summary of the measures adopted against the installation of the Braskraft in that region. The meeting concluded with the elaboration of a document titled "The Piracicaba Declaration." The Piracicaba prefect then gave a luncheon in honor of the participants.

### The "Declaration"

The text of the "Piracicaba Declaration" as approved at the meeting is as follows:

"The municipalities of the Piracicaba River Basin are still suffering to this day from the ineptitude of governmental mechanisms and organisms. They have been seduced by a false premise of progress and development. They succumbed to the continuous, uncontrolled and accelerated establishment of private and state-related enterprises in the region, to the detriment of those goals that are nobler than man's ambitions and of the ecosystem in which he lives, represented by the preservation of his natural environment, his habitat, his rivers and air, his fauna and flora. These municipalities are assuming from now on, a common posture and a joint principle of action and are signing and affirming this declaration:

1. Man possess the fundamental right to live under conditions conducive to his welfare and the protection of his and his family's health, and it behooves the municipal, state and federal governments to establish the conditions for social and economic development in accordance with standards that guarantee the preservation and conservation of the environment.
2. No program for economic and social development may affect the quality and the existence of natural resources such as soil, water, air, fauna and flora: it is the responsibility of each generation to preserve the integrity of living conditions for all future generations.
3. The competent organs are called upon to utilize all technical and scientific resources possessed by all humanity in the rehabilitation and conservation of the environment, thus restoring credibility to institutions, in the secure knowledge that they shall not succumb to those interests that are less worthy than man himself.
4. It is vital to transcend geographic frontiers and to initiate a rational plan encompassing the whole region, that will efficiently and adequately reconcile local and regional interests in a joint attempt to solve the dilemmas posed by the needs of the municipalities' development and the requirements of environmental preservation.
5. The overwhelming force of this declaration must engender a complex range of reactions emanating from communal feelings, which must be considered when establishing industries or other enterprises that may contribute to the devastation of the environment by destroying it or polluting it; consequently, these industries must provide technical guarantees for the preservation and conservation of the environment and for the welfare of neighboring communities. Any infraction to the above or any irresponsible action taken by any enterprise shall be considered a threat to the population's quality of life.
6. The above principles shall be maintained and exercised through the mutual cooperation of the municipalities, which will bring all their power to bear on private, official, local, regional or national, isolated or sectorial circles through the Piracicaba Basin communities.

7. All power emanates from the people and must be exercised in its name. As such, the Piracicaba Declaration is the result of the concern and the desire expressed in the popular will to preserve the environment, and its terms must be adhered to by everyone in the communal exercise of each individual's obligation to strive for the preservation of man's hard-won and inalienable right to life."

8980

CSO: 5000

POLLUTION CONTROL GAINING GROUND IN SAO PAULO

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 4 Nov 77 p 38

[Text] Secretary of Public Works and Environment Francisco de Barros declared yesterday that environmental conditions in the Baixada and the Santos estuary will be "considerably improved" within one-and-a-half years following the signature of a contract between the CETESB [Basic Sanitation Technological Center] and the COSIPA [Sao Paulo Iron and Steel Company] at the Companhia Siderurgica Paulista. The implementation of the 3-year, 30 million cruzeiro contract will institute control of air, soil and water pollution caused by the metallurgical factory.

"We are today officially instituting environmental controls for the Cubatao and Baixada Santista areas, and we express our appreciation for the efforts and the support of all the polluters in the region," the secretary stated, conceding, however, that "we are still dealing with higher pollution indexes than those tolerated by law and we do have the most polluted areas in the world."

Francisco de Barros was accompanied by a large group. During the course of his visit to the factory, two other environmental protection measures were disclosed: architect Ruy Ohtake has been hired by the COSIPA to be in charge of landscaping operations for the firm that started as of yesterday. "This improvement of the environment is aimed at establishing better living conditions for the 20,000 workers," he said. Moreover, the CETESB announced that it has installed vice new air pollution detectors in Cubatao, which also started to function yesterday and whose findings, according to engineer Nelson Nefussi, will be released weekly. "We shall thus obtain the first accurate data on pollution."

COSIPA president Plinio Asmann professed to be satisfied with the agreements reached with the secretariat of the environment, and said that the \$8 million invested by the metallurgical factory in the fight against pollution "are investments that produce good returns." He expressed his satisfaction with COSIPA's record production of 150,499 tons of pig iron for last month. "We are succeeding in reaching levels of production never

attained before," Asmann said. "Last October we reached almost incredible levels of production (in the categories of rough roll and steel production). We produced approximately 1,000 tons of metallurgical coke; despite maintenance problems, the steel factory produced an extraordinary 150,000 tons of ingots, and the roughing mill's production exceeded 150,000 tons. We shall attain the 2 million-ton mark within the foreseeable future."

#### Lack of Equipment

During his tour of COSIPA's industrial installations which lasted slightly over an hour, secretary Francisco de Barros noticed the thick clouds of ferrous oxide--a reddish smoke emitted for 20 minutes at 50-minute intervals--and the evil smell of other gases and of the liquid effluents discharged directly into the estuary. Thus, despite the unbearable heat, no one even dared open the windows of the tour bus.

Steel factory manager Sergio Mateus Antunes Mattos explained that the installation of the second anti-gas pollution unit should be completed by the beginning of March 1978, and that there will be four converters by the time the steel factory will be operating within the planned timetable (October 1978). "At present, we are emitting polluted smoke daily because we only have two converters. When the third converter will begin functioning in December, smoke will only be emitted every 5 or 10 days; with our fourth converter, which will be operative a year from now, smoke will no longer be emitted except for those times when the units will be cleaned."

Francisco de Barros expressed his overwhelming satisfaction with the COSIPA plans, adding that it is the first industry that is making plans to fight pollution. Additional projects will follow in the next few weeks. "We shall have taken the necessary steps and approached all the sources of pollution in the state within the next 3 or 4 months." Barros also expressed his satisfaction with the fact that the Sao Paulo government and the business firms are cooperating on the subject. "We are speaking the same language; in Sao Paulo, environmental protection and development go hand in hand. No longer is development achieved at the expense and to the detriment of the environment. Development and production can co-exist with the population's quality of life."

According to Barros, 1,800 pollution control devices are operating throughout the state, and the government's urgent prodding on the subject has created a problem: "Ninety percent of the necessary equipment is manufactured locally, and manufacturers are encountering great difficulties in satisfying increased demand. Within two years, however, the situation will have eased considerably."

Saying that he does not even know what the cost of his services to COSIPA will be, architect Ruy Ohtake reticently said that the

metallurgical plant's landscaping plan has been divided into two phases: an immediate action phase and long-term one. "We have already initiated clean-up operations as of today. During the four months of the first phase, we shall deal with the visual aspect (clean-up and painting), the access to COSIPA, the restructuring of the highway system, landscaping, the construction of an overpass connecting the railroad station and the factory, and the complete asphaltting of the interior area." Geraldo Luiz Romeo of the factory's maintenance department said that the goal is "to achieve the kind of environment that makes people feel good, with paved areas and greenery." Ohtake liked Asmann's definition of his task: "It will be a process of environmental hygienization."

While all the other officials were acknowledging that the Cubatao industrial complex--and especially COSIPA--is seriously polluted, Dr Pedro Tosta de Sa (COSIPA official and president of the Municipal Council of the Environment of Cubatao) was insistently declaring to newsmen that "what you call pollution does not affect the local population." As an example, he cited the fact that he has conducted a study of 500,000 medical case histories at the city's emergency rooms between 1969 and 1974, which revealed a lesser incidence of respiratory diseases than noted in other localities throughout the country. "I am big, strong and ruddy-cheeked; I have seven children. Is this pollution really so bad?" asked Tosta, who resides in Santos.

Dismissing these statements, secretary Francisco de Barros later expressed his concern over the living conditions of Cubatao's 75,000 residents. "Besides pollution, I am concerned about the incidence of floods, as houses nowadays are not only flooded by water, but also by sewers, and are contaminated by the industrial wastes discharged by factories into the rivers. I believe that this problem will also be solved by the end of 1978. We are investing 500 million cruzeiros in flood control in Cubatao."

Referring to the city of Sao Paulo, Barros disclosed an encouraging fact: "The air is cleaner than two years ago, in spite of the fact that Sao Paulo's development has proceeded at a faster pace. We have 25 percent fewer particles and 15 percent less sulphur dioxide than in 1975. Last winter, for instance, carbon monoxide decreased by 17 percent."

#### The Estuary's Importance

The contract signed yesterday by the CETESB and COSIPA stipulates that the former will be responsible for controlling air, soil and water pollution caused by the metallurgical installations, eliminating the ferrous oxide cloud on a short-term basis; it will also train COSIPA personnel at all levels in the field of environmental sanitation, and will conduct feasibility studies for new industrial installations that could prove harmful to the quality of the environment.

Plinio Assmann emphasized that "in spite of the difficulties of the national economy, we are attaining record levels of production. The nation is clamoring for steel, which means that we must increase production still more. I do hope we shall be able to discipline the environment, at least in connection with our firm, as this would mean a great deal: the Santos estuary (into which COSIPA discharges liquid effluents) is the greatest natural heritage the Baixada Santista possesses. More developed countries are fighting for each millimeter of this type of estuary space. Furthermore, this is the exit point for our exports."

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## BRAZIL

### POLLUTION DESTROYS FISHING ON NORTHEAST COAST

Rio de Janeiro O GLOBO in Portuguese 14 Nov 77 p 6

[Text] One of the largest shellfish beds of the Northeast coast is doomed to extinction due to the effluents of eight plants, alcohol and brandy distilleries and a paper and carton factory. All these sources of pollution are located along the rivers that form the Goiana basin, in the Northern Forest Zone of Pernambuco State, whose waters flow into the Atlantic Ocean.

The effluents affect the beaches of Pontinha, Canoe, Carne de Vaca and Ponta de Pedra, in Pernambuco and Acau and Pitimbu, in Paraiba, known to be among the richest in fish along the entire Northeastern coast, and where a thriving community of fishermen had settled for years. Until 1968, when these industries did not pollute in such concentrated form as they do now, the daily catch could reach 8 or 10 tons which assured an active trade with Recife and other areas.

Eulalio Ribeiro dos Santos, City Councilman for the MDB [Brazilian Democratic Movement] and himself a former fisherman, says that in Goiana the erstwhile 700 fishermen have been reduced to ten, "and these ten are starving." The same happens with the people who fish and catch crabs (usa and guaiamum). From 250, they have dwindled to six or eight. Oysters have disappeared from the market, lobsters have become rare, and shrimp, formerly abundant throughout the year, can now be found only during the winter, a period corresponding to slack production between harvests at the sugar refineries.

On the beaches, it has become commonplace to find tens of tons of dead fish and crabs. In the town of Goiana, when the wind dies down, especially at night, the foul smell coming from the Goiana channel contaminates the atmosphere and threatens the health of the town's 40,000 inhabitants.

#### The Most Polluted River

According to the President of the Pernambuco Environmental Pollution Control and Hydraulic Resources Management Company (CPRH), Carlos Americo Carneiro Leao, the Jocanca River, the most polluted stream in Pernambuco State, lost

its fauna and flora a long time ago. The Goiana basin is part of the State's coastal watershed, together with the basins of the Igarassu, Capibaribe, Jaboatao, Grajau, Pirapama, Ipojuca, Sirinhaem, Nha, Mundau rivers and others of smaller size.

The rivers in Siriji valley, in the State's Northern Forest Zone, are tributaries of the Goiana river. Thus, the Capibaribe-Mirim, whose source is in Timbauba, receives effluents from several plants located nearby, and in Goiana, the caustic soda released by the factory of the Northeastern Corrugated Carton [Co.] (Ponsao) before flowing into the Goiana river, on its way to the Atlantic.

For the fishermen and the CPRH, the caustic soda pollutes much more than the effluents of the sugar mills and factories, because some mills have already given adequate treatment to their effluents or, according to Carlos Americo, they otherwise dispose of them. Unlike caustic soda, the remains of sugar mills are biodegradable along the river. It is the excess of effluents that must be overcome.

The Ponsa buys its raw material, sugar cane waste, from the mills in the area. And it utilizes a large amount of water from the Capibaribe Mirim river to wash the waste in caustic soda, returning the effluents to the river. The importance of Ponsa for the region lies in the 700 direct jobs it provides and in its sales tax contribution to the state, around 30 million cruzeiros. For these reasons the authorities are studying carefully the way it can be pressured to resolve the pollution problems.

Klabin Industries, to which this plant belongs, has recently installed an anti-pollution system, but its own directors regard the results as unsatisfactory. In Brazil, a maximum proportion of pollution permitted is 7.2 kilograms of BOD (oxygen biochemical demand) per ton of effluents. According to one of the directors of Klabin, "Ponsa should not be too far from this rate," but in the United States this proportion has caused many protests. For the future, even in Brazil, the reduction of the maximum amount to 3.5 is envisaged.

Caustic soda forms large white stains along the river.

Says Eulalio, in his fisherman jargon, the gutter catches the "maritime race" in the North and goes as far as Pitimbu (in Paraiba, at the border with Pernambuco), killing all the fish in the traps. When the tide is high it reaches as far as Pontinha. In Acau there no longer is any fish in the bay.

#### The Fisherman's Drama

Jose Joaquim de Sousa, 63, is one of the remaining fishermen in the Goiana river. In 18 years he managed to assemble 48 canoes and to reach a reasonable financial status which permitted him to send his six sons to study in

Recife schools. This, however, without ceasing to work daily on the river, searching mainly for shrimp.

Jose Joaquim is selling everything. He has nothing more to do and does not care to go to the river. Today he busies himself putting finishing touches on the boats exhibited for sale along the shores of Goiana channel, beside dozens of others in the same situation, and for the same reason: pollution.

"I've been here 18 years,"--says the fisherman--"and have never seen anything like this. It amounts to 7 leagues (42 kilometers) lost in this manner. We are all begging. I used to come back here with seven canoes full of fish and shrimp. Today we don't even have enough to eat. Yesterday I caught crabs to kill hunger, but I spent all of last night and this morning with dysentery."

An identical problem has affected the children who used to bathe frequently in Goiana channel, built in the 19th century to serve as a port for the ships carrying Rio Grande do Norte salt, but is now abandoned. Many of those children died. Recently, the harbor master, Commander Paim, inspected the channel and with a single comment buried the hope of the people of Goiana to reactivate it economically: "The Goiana people insist on calling this polluted ditch a river."

#### The Culprit

Even recognizing the high level of pollution caused by Ponsa, its general manager, Roberto Brauer, believes that the government shares a large part of the blame for the present situation, because it has not yet defined which rivers may or may not be polluted and the level of this pollution, since progress demands that price.

The president of CPRH, Carlos Americo Carneiro Leao, proves that this is not so. The Ministry of the Interior defines the situation of the rivers through ordinance of 15 January 1976. Within the states, he admits that there has not yet been a standard for all rivers as to the effluents that may be dumped in them.

According to Carlos Americo a diagnosis is being made. An agreement signed between SUDENE and the Environmental Secretariat will show the present situation of the Pernambuco's rivers. A result will be the classification of the rivers so as to meet the requirements of the specific federal legislation and permit more effective protection.

For Carlos Americo, however, pollution is not only the responsibility of the government or of industries. There is a need for raising the collective consciousness so that the problem can be faced. In his opinion, unilateral measures are not enough:

"Municipal authorities have a broad role, especially in the control of urban development, which is a prime factor in the causes and not only the effects of this evil, which is not a purely Brazilian prerogative. However, in Brazil, it must be handled with a measure of responsibility and, above all, with good sense."

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## BRAZIL

### BRIEFS

POLLUTION KILLS 28 IN MINAS--Twenty-eight people died in Bicas, a town near Juiz de Fora, during the period between January 1975 and March 1977, as a result of respiratory problems caused by the pollution generated by Mineracao Biquense Ltd. The charge was made by Mayor Amilcar Reboucas to the Committee on Environmental Policy of the Secretariat for Technology, which advised him to order the mining company to move elsewhere if it refused to use anti-pollution filters. According to the Mayor's charge, 24 kilograms of dust with a high silicone content are produced, which caused 28 deaths within a little over two years, in addition to the hospitalization at Sao Jose Hospital of 229 persons with lung problems, of which 100 cases were of children under 15, 60 between the ages of 16 and 50 and 69 of people over 50. Physicians of the INPS [National Social Security Institute] in Juiz de Fora have also stressed the danger of pollution brought by Mineracao Biquense: lung specialist Mariano Jose Leal treated six cases of silicose in 1976, while his colleague Adalberto Castro Loures treated ten cases in 1976 and four in 1977. All cases of silicose occurred in plant's own workers. The only equipment that Mineracao Biquense has to combat pollution are two large exhaust ventilators which have not solved the problem, since they remove the dust from one spot and throw it elsewhere. For the time being, the case is being handled by the local County Executive. [Text] [Sao Paulo FOLHA DE SAO PAULO in Portuguese 14 Sep 77 p 14] 8944

DEFORESTATION OF AMAZON REGION--The deforestation process in the Amazon region, which has been accelerating during the last few years, may be completed within 40 years, leaving the area with the same characteristics of the Northeast, which lost its forests over a period of 400 years. This forecast was made by the president of the Society for the Preservation of the Natural and Cultural Resources of the Amazon Region (SOFREN), Camilo Martins Viana. He took as a basis for his calculations the 581 projects for the occupation of the area, which BASA (the Bank of Amazonia) have financed in 2 years, a total expenditure of about 6 billion cruzeiros. Each project represents an average deforestation of one million hectare. In one of the projects--that of Jari Farm, whose area extends over 6 million hectares--two floating cellulose factories, which will devastate some 2,880 hectares of forest land per year, will begin operation. Recently advisors to millionaire Daniel Ludwig, owner of Jari Farm--one of the largest agroindustrial complexes in the world--have admitted that the "Orange Agent" (a mixture of Tordon-155 with Dioxin), used by the U.S. Army in Vietnam to destroy the fauna and flora, is being utilized in the north of Para State to defoliate areas intended for pasture land. [Text] [Rio de Janeiro O GLOBO in Portuguese 5 Nov 77 p 7] 8944

NATIONAL ENVIRONMENTAL PROTECTION EFFORTS ASSAYED

Khartoum AL-SAHFAH in Arabic 8 Nov 77 p 7

/Article: "Science and the Environment: What Are We Doing To Protect the Sudanese Environment?"/

/Text/ If industrial and technological progress is the reason for pollution of the environment, or if the unregulated, disorganized population explosion has been a reason for the destruction of man's environment, what are we doing to avert the effects of culture and civilization?

This was the starting point of our conversation with some members of the Sudanese Society for Protection of the Environment, which is the first society of its kind and has been formed in the Sudan through individual initiatives, out of the academic, patriotic impulse to contribute to spreading about environmental consciousness.

Purposes of the Academy

Our meeting was with Dr 'Abd-al-'Aziz 'Abdallah, lecturer in the Biology Department of the Faculty of Science at the University of Khartoum, chairman of the society; Thomas Tawfiq, scientific researcher in fish research and secretary of financial affairs; Dr al-Taj Fadlallah, lecturer in the Chemistry Department of the Faculty of Agriculture; and Mu'tasim Bashir, scientific researcher of the Wild Animal Research Center.

Dr 'Abd-al-'Aziz 'Abdallah talked about the goals of the society, stating,

"Population growth and scientific and technological progress have left bad effects as far as human living, security and health are concerned. These conditions have led to the appearance of dangerous things, including, for example:

"Pollution afflicting rivers and lakes and threatening life within these lakes.

"An increase and spread of poor areas of towns where sanitary living is nonexistent.

"Grim danger to aspects of civilization via the results of industrial change.

"Therefore we had to get going, and we in the Sudan are facing a new stage of development and the basic changes in the Sudanese environment which this reflects. A number of persons concerned with environmental affairs met and held a meeting at the University of Khartoum, attended by a large group, more than 200 in number. The first Sudanese environmental protection committee was formed, and this is aimed at:

"Spreading scientific consciousness among citizens regarding the environment and its value and importance as a vital basis for improving society.

"Concern for the country's natural resources, and an effort to protect it by guiding exploitation of it in the optimum manner.

"Attention to the study of environmental sciences and setting down the natural history of the Sudanese environment."

#### The Society's Means

Dr al-Taj Fadlallah said that the means the society will use to achieve these objectives are founded on an effort to establish society branches in various towns and issue a specialized magazine dealing with environmental issues and problems.

Secondly, cooperation with vocational agencies which are working in the field of the environment and the effort to issue laws which will guarantee that the environment is protected and will coordinate agencies and laws with the objective of achieving a better level for the environment.

Third, recording environmental pollution by photographs and films and striving to establish specialized museums.

Fourth, cooperating and exchanging expertise with Sudanese and foreign institutions concerned with environmental affairs.

#### Environmental Issues

Prof Mu'tasim Bashir talked about the environmental projects which the society will deal with through study. These are broken down into a number of subjects:

1. Air and water pollution.
2. Study of the animal and plant groups in the Sudanese environment.
3. Study of the marine environment, pollution of certain foodstuffs by chemicals and industrial materials, and a study of the effects of insecticides,

in addition to research into human, social, and economic phenomena of pollution.

Essentially, the society aims at attaining a large amount of official and popular concern with the Sudanese environment, and all sectors have an influential and effective role in improving the environment or causing it harm. The ministries, for example the Ministries of Health, Social Affairs, Housing, Education, Information and Tourism, as well as the National Research Council, have their role.

The society will perform extensive publicity campaigns to warn citizens of the need to protect the health of the environment.

At this point we refer to the statement by Dr Joseph Najjar, chairman of the Lebanese Scientific Research Council, who said, "The natural environment, which is the environment in which we live, and which we call the environment, is suffering these days from problems which are increasing, growing and proliferating in number and effect every day. Since science and technology have been the cause of the pollution and problems of the environment, the task of scientific research has become one of performing the studies necessary to prevent pollution of the environment. Everyone must know that the solution to problems of the environment, particularly pollution, will only come about through scientific research, and herein lies the importance of the role scientific research plays in environmental issues."

Dr Najjar goes on to state that the effort to protect the environment is broken down into two basic stages: the stage of studying the environment in a scientific, analytical manner, and the stage of conveying this information to the Lebanese citizen. Education is concerned with the second stage, taking the results of environmental studies and research and placing them in an interesting, convincing context so that they will be part of the structure of knowledge of the ordinary citizen. For this role to be carried out, educational planning must include three aspects:

1. The aspect of the basic education which the student must acquire from the environment, its ramifications and means of protecting it.
2. The approach or position which must be formed within the student regarding the environment.
3. Development of skills to protect the environment.

Proceeding from these objectives, and in order to achieve them, the Sudanese Society for Protection of the Environment is striving to play its part.

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## ENVIRONMENTAL PROTECTION MEASURES IN MOSCOW

Moscow GORODSKOYE KHOZYAYSTVO MOSKVY in Russian No 10, Oct 77  
pp 35-37

[Article by B. S. Kozyritskiy, scientific secretary, Moscow Inter-Departmental Scientific and Technical Council for Environmental Protection: "A Responsibility of All Muscovites"]

[Text] Almost everyone who visits our city, be they tourists or experts in such fields as ecology or the arts and culture, is in agreement about the clean appearance of our streets and squares and the abundance of green plants. Foreign representatives believe that the results of Moscow's environmental protection programs surpass those of all other world capitals. Such recognition is equivalent to giving high marks to the work being done by Moscow residents at every level under the leadership of the Executive Committee of the City Soviet.

Multiple plans for environmental protection have achieved excellent results. Nevertheless, the worthwhile task of transforming the capital into a model communist city demands even more dedicated effort.

Planning work for the protection of Moscow's air quality has been in progress for approximately 30 years. A laboratory system for controlling the condition of the air basin is operational in the city, along with fixed control points located in all of the administrative regions and industrial zones and along the main highways. The data collected assist in effectively organizing measures for reducing harmful emissions and in subsequently carrying out the measures at Moscow's enterprises.

While assigning major importance to the protection of the capital's air basin from pollution, the eighth session of the Moscow Soviet (at the thirteenth convocation in March 1973) in its resolution: "On Strengthening the Protection and the Enhancement of the Moscow Environment" already had affirmed

the measures which call for the installation of dust control systems and gas scrubbers; the transfer of the most health hazardous enterprises, production sections, or shops to the outskirts of the city; the modernization of existing enterprises; the introduction of more advanced technological processes which eliminate harmful emissions; and the elimination of the use of small-coal burners by shifting consumers to centralized heat supply.

During the Eighth and Ninth Five-Year Plans: more than 400 enterprises which were creating health hazards were either moved to the outskirts of the city or were rebuilt; production processes were revised at more than 100 enterprises; at least 4,500 small boilers were eliminated; and approximately 3,000 dust control and gas scrubber systems were installed. At the present time, approximately 12,500 of these anti-pollution devices are operating in industrial enterprises.

These measures have had a substantial impact on health conditions. The emission of hazardous substances has been curtailed sharply at a large number of enterprises. A fundamental change in technology and the elimination of those production sections which are the most unfavorable to health has resulted in a total halt in emissions to the atmosphere of dichloroethane at the chemicals and pharmaceuticals plants imeni Semashko and imeni Karpov, of dust and mercury from the Svoboda factory, of acid fumes, isopropyl alcohol, and phosphorus oxyfluoride from a salicyl plant, of nitric oxides from the chemical plant imeni Voykov, and from others.

More than 70 dust control and scrubber devices have been installed in the Moscow Electrode Plant over the past 10 years. These devices collect more than 6,300 tons of dust annually, which is reused by enterprises in the chemicals industry. Processes for batching heat-treated raw materials also have been improved and processes at several production sections have been revised with the goal of reducing harmful emissions.

Where 10 years ago, dust, soot, and carbon monoxide could be detected in concentrations exceeding permissible standards within 50 meters of the plant site, today their content conforms with the maximum permissible concentration.

Between 1965 and 1969, the atmospheric concentration of hydrogen sulfide near the Dorogomilovskiy chemical plant was 10 times higher than maximum permissible levels. Currently, the concentrations have been reduced to standard levels. The environment was improved by eliminating many pollutant generating production sections, revising the plant's product mix, and by installing anti-pollution devices.

Measurement data on the background pollution of the atmosphere by dust and sulfur dioxide demonstrate the substantial improvement of the air basin resulting from the conversion of Moscow TETs and boiler plants to gas fuels. The dust content in the air was reduced from 0.86 to 0.26 milligrams per cubic meter while sulfur dioxide pollutants were reduced from 0.77 to 0.21 milligrams per cubic meter between 1960 and 1970.

Motor transportation managers have carried out specific actions aimed at maintenance servicing of motor vehicles and reducing the toxicity of exhaust gases. For example, all taxicab fleets of the Administration of Passenger Vehicle Transportation operate diagnostic centers equipped with gas analyzers and maintain controls over the carbon monoxide content in the exhaust from vehicle engines. Special centers have been established by enterprises of the Moscow Main Administration of Motor Transportation and bus fleets of the Administration for Passenger Transportation for the inspection and adjustment of engines to minimal levels of toxicity. A branch of the 6th Motor Repair Plant of the Moscow Main Administration for Motor Transport has established systems for the centralized repair of engine fuel lines and electrical systems for all motor transportation enterprises in the city. At the request of car owners, service and repair stations also will inspect and adjust engines to control the carbon monoxide content in exhaust gases.

Judged by the work accomplished thus far, the path chosen to solve the problem of protecting the municipal air basin from pollution was a correct one. Nevertheless, much still has to be done to eliminate completely incidents of the discharge of harmful substances into the atmosphere. A number of industrial enterprises should be supplied with the latest dust control and gas scrubber devices. At the present time, plants such as the Serp and Molot, imeni Likhachev and Dinamo, State Bearing Plant No. 1 (GPZ-1), the AZLK plant, and several TETs still are permitting the emission of considerable amounts of harmful substances into the atmosphere. These enterprises have not fulfilled plans for the installation of dust control and scrubber systems. Available anti-pollution devices are used ineffectively at a number of plants and factories. The devices often stand idle, they are repaired on a tardy basis, or they are operated incorrectly. The program of introducing compressed gas and electrically-driven vehicles into service is proceeding too slowly.

Improvements to the municipal air basin currently can be achieved by completing the installation of dust control and gas scrubber systems in all enterprises, enhancing the effectiveness of devices which are already installed, introducing

more advanced technological production processes which eliminate harmful emissions, improving the fuel balance by increasing the use of gas and low-sulfur fuel oils for TETs, moving enterprises that are hygienically and sanitarially hazardous to the outskirts of the capital, and by rebasing all of the remaining enterprises within industrial zones.

A number of scientific research institutions are studying the problem of reducing the toxicity of vehicle exhaust gases. Experiments are being carried out which focus on the building of a fundamentally new type of engine or the upgrading of existing ones. But this is a long-range program. The immediate task is one of organizing the operation of the existing fleet of vehicles so that their engines will emit a minimal amount of harmful substances to the atmosphere.

The state has implemented a standard which restricts the maximum permissible carbon monoxide volumetric concentration in exhaust gases to 2 percent. Assembly line manufacture of vehicles with higher carbon monoxide content is prohibited. But some motor transport managers, primarily at ministerial or departmental levels, fail to display a proper amount of attention to the compliance with the requirements of this standard. Timely and qualitative servicing and repair of vehicles are not being done, particularly for fuel lines and ignition systems, which control the level of pollutants in exhaust gases. Control measurements reveal that approximately 30 percent of the vehicles in operation on the highways are emitting excessive carbon monoxide exhaust.

We must both mitigate rapidly the shortcomings cited and also provide for the efficient operation of the city's total motor pool. Otherwise, further solutions to environmental protection problems will not be forthcoming.

Considering that motor transportation is the primary source of pollution of the municipal air basin, a 1977-1980 plan for scientific research and the introduction of new technology provides for the implementation of a series of measures to reduce substantially the toxicity of motor engine exhaust. This is in addition to those measures now in effect which are directed toward improving the maintenance servicing of vehicles and the introduction and operation of compressed gas and electrically-driven motor vehicles. The 1977-1980 plan calls for the use of catalytic neutralizers, low-toxicity carburetors, low-fume additives, and diesel fuel.

Calculations indicate that the introduction of catalytic neutralizer systems, low-toxicity carburetors, and other systems, along with compressed gas and electrically-driven vehicles,

would yield the potential to decrease the carbon monoxide content in the city's atmosphere to maximum permissible levels. Catalytic neutralizers developed by the Central Scientific and Research Laboratory for the Toxicity of Engines are capable of purifying the carbon monoxide and hydrocarbon content in engine exhaust by 80 to 90 percent. The system of neutralizing exhaust gases has already undergone laboratory, bench, road, and operational tests.

In accordance with a coordinated 1977-1980 plan of the Ministry of Tractor and Agricultural Machine Building and the Executive Committee of the Moscow Soviet, testing under operating conditions on vehicles from the Moscow Passenger Transport fleet of a system to reduce atmospheric pollution in Moscow from harmful emissions from motor transportation equipment has begun. It is planned to install 1,000 sets of this system in 1977-1978.

After the tests are completed, more stringent standards on the content of harmful substances in exhaust gases will be developed and implemented in stages.

Until 1980, catalytic neutralizers will undergo prototype production at the Central Scientific and Research Laboratory for the Toxicity of Engines. The neutralizers then will go into mass production at the Dimitrovgradskiy Motor Assembly Plant of the Ministry of the Automotive Industry.

Environmental protection has a high priority in the social and economic plan for the development of Moscow. The plan includes a series of measures for transforming the capital into a model communist city. Approximately 500 million rubles from all financial sources, or twice as much as was spent between 1970 and 1975, will be spent during the Tenth Five-Year Plan to put these environmental protection measures into effect. The full and effective use of these assets will be dependent on the daily activities of management and public organizations. The mail received by the Moscow Soviet from city residents indicates that more and more Moscovites are contributing to this effort.

The 1976-1980 economic development plan for Moscow calls for the implementation of a series of measures aimed at improving the environment and at the rational use of natural resources. The amount of state capital investments allotted to meet these goals will total 232 million rubles.

Planned measures for improving the condition of the air basin will be accomplished by upgrading the structure of the municipal fuel balance and by installing dust control systems and gas

scrubbers. Accordingly, anti-pollution devices with a capacity of 3.87 million cubic meters per hour will be installed over the five-year plan period.

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## PROTECTING THE UKRAINE'S WATER RESOURCES

Kiev PRAVDA UKRAINY in Russian 5 Aug 77 p 4

[Article by M. Tatarenko: "Rivulets Flow Through the City"]

[Text] Kiev is known as a garden city. Its streets are buried in verdure, and it would be hard to find another city with as many parks and squares. But Kiev is also a mammoth industrial center. Much work is, therefore, being done to prevent negative environmental impacts from industrial enterprises. Nevertheless, one environmental problem is being solved much too slowly.

The situation is that there are several rivers within the boundaries of the city whose condition is left uncontrolled. The Lybed' River is one example. The Lybed' flows through five sections of Kiev and empties into the Dnepr. The Lybed' River is fed by two concrete storm drains. Daily thousands of cubic meters of untreated wastewater, municipal sewage, and effluents from a variety of industrial enterprises (including petroleum products enterprises) are dumped into the river. Moreover, 2.2 of the river's 13 kilometers of channels have yet to be improved.

The Syrets stream is 7 kilometers long. It also flows into the Dnepr and carries turbid and polluted waters to it. Additionally, the Minsk area contains the so-called Dmitriyevskaya Ditch and the Podol'skaya and the Moskovskaya areas contain the Kuryachiy ford and the Sovskaya ditch, respectively. All of these small streams are unsanitary. The reclamation channel in Darnits is an object of grave concern. Effluents from the Kiev Chemical Fibers Combine, the TETs-4 and the ATP-2240 are dumped into the channel, and all of this turbid water also flows into the Dnepr.

Large sums of money are allotted annually for maintenance of the Darnitskaya reclamation channel. But the Administration

for the Construction and Operation of Highways has been disrupting the work. Currently, 1,300,000 rubles have been earmarked for channel maintenance work. Of this figure, 300,000 rubles are for this year. It remains to be seen whether the administration will reinterfere with the work.

It should be noted that 50 enterprises and organizations in Kiev already have built industrial recirculating water supply systems and wastewater treatment and pretreatment plants. The Production Administration for Water Supply and Waste Management has placed large sewage collectors in operation, including those at such sites as the main municipal, Podol'skiy, Novokhranitskiy, and Borshagovskiy.

Notwithstanding these actions, untreated discharges continue to flow into the Dnepr. The Bortnicheskaya aeration station is overloaded to the breaking point. Consequently, the time for settling and water aeration has been reduced and the processing cycle for nitrification is not being adhered to.

The operation of state-manufactured equipment is not being mastered and construction of treatment facilities is proceeding slowly at a carbon dioxide plant, at Auto Repair Shops No. 3 and No. 12, at a margarine plant and at other plants, as well as at the Elektronmash Association.

Pollution of the Dnepr has been discussed within Gosplan of the Ukrainian SSR and at meetings of the municipal People's Control Committee. Complex measures have been developed to avoid the recurrence of similar incidents. The time is at hand to make an all-out effort to ensure that not one single cubic meter of untreated wastewater lands in the Dnepr.

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# WATER RESOURCES, ENVIRONMENTAL PROTECTION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 18 Aug 77 p 2

[ Article by Section Chief of the Environmental Division, Gosplan USSR, B. Babitch: "In the Interests of Present and Future Generations" ]

[Text] Concern for the protection of the human environment is integrally connected in our country with the general conception of the development of a socialist society. The decrees and resolutions signed by V. I. Lenin or those developed with his participation have defined the basic principles for the socialist use of natural resources. These principles have found vivid expression in Article 18 of the draft of the new Soviet Constitution. The article states: "In the interests of present and future generations, the necessary measures are being adopted in the Soviet Union for the protection and the scientifically rooted optimal use of the land and its mineral resources and the flora and fauna, for the maintenance of air and water quality, and for the restoration of the natural resources and the enhancement of the human environment."

The demand for water in the sphere of public production in the country exceeds the demand for all other natural resources combined. Consequently, the volume of water involved in the economic turnover is increasing constantly which, in turn, means that the water factor is one of the most important factors in the development and territorial distribution of productive forces.

A. N. Kosygin observed in his report to the 25th party congress: "Fundamental Trends in the Development of the National Economy of the Soviet Union Between 1976 and 1980," that "The rational use of such a precious natural resource as water is one of the most pressing economic problems." In the state plan for the development of the economy between 1976 and 1980, approximately 8 billion rubles of capital investment funds have been

earmarked for the protection and efficient use of water resources. These assets must be used to construct treatment plants with a capacity of 48 million cubic meters of wastewater daily and systems for recirculation and sequential reuse of water with a daily capacity of 150 million cubic meters. As a result, the volume of industrial and domestic wastewater treated in accordance with the established sanitary and fishery management standards will increase by more than 60 percent over the current five-year plan, while the volume of recirculated water will increase by 58 percent.

Along with the completion of water storage facilities in the Volga and Ural basins and a series of other rivers, particular attention will be given to construction in the Black Sea, the Sea of Azov, and the Baltic Sea basins, in accordance with the 1976 resolutions adopted by the Central Committee CPSU and the Council of Ministers. Large-scale measures for the protection of waters from pollution also will be implemented in the basins of the Caspian Sea, Lake Baykal, and other rivers in industrial and heavily-populated regions.

As is known, cardinal measures for the prevention of the pollution of water basins involve the development and introduction of non-discharge or low-discharge technological processes and production operations, the establishment of waste-free systems of water supply to industrial enterprises that support the complex processing of raw materials and the reuse of production wastes, and other measures. The introduction of these progressive solutions, in fact, is receiving close attention during the drafting of long-range plans.

The Soviet social system and its planned economy make it possible to foresee bottlenecks and to adopt the necessary measures for the thrifty use and replenishment of natural resources. This inspires optimism and confidence in the belief that the water resources in our rivers, lakes, and inland waterways will not be converted into "ditches" and "biological deserts."

But this doesn't mean that problems related to the careful and zealous use of water resources and their protection from pollution and contamination will be solved without assistance. Serious problems exist here which call forth legitimate alarm. Last year, according to data from the Central Statistics Board, the Ministries of the Petroleum Refining and Petrochemical Industry, the Coal Industry, the Construction Materials Industry, Light Industry, and Land Reclamation and Water Resources, as well as several union republics failed to meet the plan for capital investment and the placement of new plant capacities into operation for treatment of wastewater.

The organization within contracting ministries of special subdivisions for the construction of water and sewerage plants and treatment plants and the creation of an appropriate resources base in support of the introduction of industrial construction and a progressive building technology are being implemented slowly. This one of the reasons why important tasks are not being completed. For example, the Ministry of Construction of Heavy Industry Enterprises disrupted the schedules for the construction of a recirculating water supply system for rolling shops in the northern group of the Magnitogorsk Metallurgical Combine, and projects for biological treatment plants in Mednogorsk and combined wastewater treatment plants in Sokol and Sukhona and for a pulp and paper combine in Sokol. The Ministry of Industrial Construction did not support the effort to complete scheduled work on primary treatment plants for the Solikamsk Pulp and Paper Combine and other projects. Delays are being permitted in the construction of water storage facilities, which were planned for completion this year, at the Volgograd Biochemical Plant, the Kosogorskiy Metallurgical Plant and several others.

The treatment and disposal of wastewater is expensive. In some types of production, expenditures for treatment plants are equivalent to those required for creating fixed production capital. Clearly, as a factor of the growth in the volume of industrial effluents and the increased constraints on their discharge into water basins, cost indicators should rise still higher. According to information from scientific research organizations, the application of available advanced developments would result in a savings of 30 to 40 percent of capital investment funds compared with the application of traditional methods of treating effluents. Consequently, along with the widespread development of closed water supply systems, with no discharges or with minimal discharge of wastewater, more modern and economical methods of processing industrial wastes and the equipment and materials for treating and disposing of them need to be developed. Industry has yet to master the production or to manufacture this special equipment in adequate quantities.

The broad participation of public opinion and of all citizens under the guidance of local Soviets of Workers Deputies must bring a pronounced influence to bear on the decisions to the many problems connected with improving the environment, to the uncovering of its vital forces, and to setting up barriers against plunderers of its riches. Incidents of the extravagant use of water resources or violations of regulations for the storage, transport, and use of toxic substances and mineral fertilizers, the mindless plowing up of floodplains, negligent attitudes toward streams and toward the use of forest

watersheds, and other similar actions which result in the pollution and contamination of water resources and their depletion must be subjected to decisive rebuffs by public opinion.

In this connection, it would be worthwhile to emphasize the significant and productive work being carried out by the Permanent Inter-Republican Committee on Problems of the Use of Water Resources of the Desna River Basin, whose long-time chairman has been M. K. Krakhmalev, secretary of the Bryansk Obkom CPSU, as well as the Permanent Inter-Republican Committee for the Don, chaired by N. A. Bondarenko, secretary of the Rostov Obkom CPSU. At their meetings, the committees discuss and adopt effective measures in the struggle against the pollution of surface and groundwater sources and against soil erosion and shrinkage of tidal plantations, for the introduction of anti-erosion and field protection measures, reforestation, grass sowing on floodplains, restoration of the hydrologic regime and the water quality of streams, and many other similar projects.

It should be mentioned that agencies of the water, sanitary and fisheries inspectorates and other special service organizations have been designated by specific laws to enforce compliance with the requirements for the protection and efficient use of natural resources. In reality, however, the system of penalties for perpetrators of environmental losses is only symbolic in the magnitude of its fines, and it does not yield adequate influence on enterprises and organizations and on individual authorities who violate environmental regulations.

Doubtlessly, critical problems blocking the strengthening of environmental protection in the country will be solved, as mandated by Article 18 of the draft Constitution of the USSR. Issues to be resolved include the idea posed by a broad range of public opinion concerning the advisability of concentrating state management and control over the efficient use of natural resources in a consolidated union and republic agency. It is also necessary to strengthen the responsibility of ministries and departments, enterprises and organizations, local Soviets of Workers Deputies, managers at all levels, and every citizen of the Soviet Union for the zealous use of the natural resources, the property of all the nations, and for the protection of the environment.

In this regard, it would be worthwhile to supplement the first paragraph of Article 67 of the draft constitution with the following sentence:

"Citizens of the Soviet Union are obliged to protect and defend the environment and to use its riches efficiently while contributing to the restoration and renewal of natural resources."

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'DNEPR' ENVIRONMENTAL PROTECTION PROGRAM

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 27 Sep 77 p 3

[Article by Academician A. Alymov, Council for the Study of Productive Forces, Academy of Sciences, Ukrainian SSR: "The Distant Dnepr"]

[Text] Praised in poetry and prose as a river of beauty. A symbol of the friendship and unity of the peoples of Russia, the Ukraine, and Belorussia. One of the principal transport systems of the country. A sea of electrical energy, a source of irrigation. One could rave on and on about the Dnepr, and each individual would use his own words flowing from the heart. But today when we talk about the magnificent river, we must not lose sight of the fact that the river's name is also synonymous with the complex problems brought on by scientific and technological progress and the development of the industrial potential of the Ukraine.

Almost three-fourths of the population of the republic live along the banks of the Dnepr. Some of the largest industrial centers are situated in its basin, including giants in metallurgy, chemistry, and petroleum refining. It is inarguable that the continuous growth of industry, the chemical intensification and mechanization of agriculture, and the process of urbanization are sometimes accompanied by pollution of the Dnepr by a variety of effluents, which cause undesirable changes in the physical and chemical composition, the temperature regime, and the biological state of Dnepr waters. The fact is that the Dnepr represents 65 percent of the water resources in the Ukraine. The chances for developing the economy of the republic, therefore, are aligned closely with the rational use of these resources.

The concern of the Soviet government for the protection and the scientifically-based efficient use of the earth and its mineral resources, the flora and fauna, and the maintenance of air and

water quality is reflected in the draft Constitution of the USSR. A vivid illustration of this constitutional mandate is evident in the "Dnepr" special purpose program, proposed by scientists from the Ukrainian Academy of Science. The program is essentially the same as the complex one which was referred to in documents of the 25th party congress. The topic is one of the most precious, irreplaceable minerals on the earth -- water.

The press sometimes carries polemic attacks against the "over-regulation" of the rivers. Over the past 40 years, water use in the Dnepr basin has risen 30 times over. Accordingly, scientists have calculated that if the Dnepr was "freed" from its dams and reservoirs it long ago would have been drained dry. But it survives, and, in comparison with other great rivers on the planet, it is doing rather well. It supplies drinking water to the cities, moves the turbines of electric power stations, and carries ships and barges on its powerful back. All the while it continues to bring joy to people through the amazing beauty of its bays and flats and the golden sands of its beaches. Many resorts, fisheries, and protected zones are located along its shores. All these features are the result of many years of scientifically-based work. But life goes on and with the development of industry the knot of the problem tightens. For this reason, the Ukrainian Academy of Sciences initiated the long-range program. Almost 50 scientific and planning institutes of the Ukraine, Russia, and Belorussia have already contributed to the practical implementation of the plan.

What are the main difficulties at this stage? Primarily there has been a conflict of interests. Industry returns effluents to the river, but the city and the river itself need pure water. The farmers want to increase the moisture level on the fields, but at the same time it is also necessary to maintain the level of water in lakes to ensure the productive efforts of fish culturists. The interests of power systems personnel and river transport workers rarely coincide. The Dnepr program is intended to mitigate these conflicts, to regulate the use of the Dnepr waters on a scientific basis, and to provide for an economical and judicious expenditure of funds allocated by the state for the protection of the environment. The program sets up short-term and long-term goals: (1) to maintain the natural balance of the river basin and the reservoirs; and (2) to predict for years into the future all aspects of development in the region. This is done to meet completely the water demands of the economy and the people while neither damaging the river

nor the environment, but rather improving and enriching them. The Academy of Sciences of the USSR, the Belorussian Academy of Sciences, the Ukrainian Academy of Sciences, more than 10 union and republic ministries, Gosplan USSR, and Gosstroy USSR and Gosstroy the Ukraine were involved in developing the program. The list of participants by itself already reflects not only the importance of the problem but also the fact that the solution is well within the grasp of an individual socialist country, possessing an advanced state of science and technology that has attained the most progressive level. The Dnepr program is also a pioneering one. After the plan is implemented, the results will be used to guide the working out of complex solutions pertaining to the basins of other large rivers in our country.

Long-term plans have been developed to implement a large volume of research, planning, and construction under the aegis of the Scientific Council of the Academy of Sciences of the Ukraine. The lead organization is the All-Union Research Institute for the Protection of Water in Khar'kov. Economists are preparing forecasts for the development and distribution of the productive forces of the basin and for the quantity and assortment of manufactured production. Water requirements, industrial technology, and equipment systems needs will be calculated from this information. Effective measures would provide for maximum conservation along with the complete liquidation of pollution of water sources by industrial discharges. Much will have to be done before water-free technology becomes a reality, as well as closed systems of water management for enterprises, which eliminate the discharge of processed water into reservoirs.

Ecologists are carrying on investigations which make it possible to calculate the reserves of the natural complex. This information will make it possible to determine the water storage balance of the Dnepr and to make specific recommendations for the development of industry. Scientifically-based requirements for ecological expertise are being developed for every management project. Experience is showing that it is a difficult matter to reconcile economical and ecological decisions. One psychological barrier is interfering: too many feel that pollution of the rivers is an inevitable outcome of the scientific and technological revolution. But as a matter of fact it is this indifferent position that we must oppose. The experience of a group of leading enterprises in Zaporozh'ye, Kremenchug, Cherkassy, Dnepropetrovsk, and Krivoy Rog, in which recirculating water supply systems are operating effectively is the best argument against such points of view. It is precisely science and technology which is placing in our hands the means for

restoring the ecological equilibrium wherever it has been disrupted for whatever cause.

There is also inherent difficulty in the size of the problem. The Dnepr basin is enormous and comprises hundreds of cities and settlements, tens of thousands of villages, and thousands of enterprises. The excellent results of collective efforts here could be ruined by a few unlawful actions. This means that, besides scientific, technological, and organizational problems, moral and educational problems are also increasing. It is necessary to fight against ignorant approaches to the use of resources and against laxness and indifference, and also to educate people by positive examples.

The growth rate of productive forces in the Dnepr basin will be high during both the present and future five-year plans. The construction of enterprises and thermal and atomic power plants, the growth of such older cities as Kherson, Cherkassy, Sumy, Priluki, Novgorod-Severskiy, Kovel', Sarny, Dubno, and Smela, and the appearance of new ones such as Svetlovodsk and Vol'nogorsk, and the birth of new industrial complexes, all of these factors will pose problems during the transition to a higher level in our interrelationship with the environment.

Scientists in the Ukraine along with their colleagues in Belorussia will solve the problems of Poles'ye (a huge region in the European section of the USSR) within the framework of the Dnepr program, as well as problems of streams, of afforestation of shores, and the maintenance of fertile soils.

Much is being done for the rivers, which so generously share their wealth with us. Advanced treatment plants and dikes are being constructed and the latest achievements in biology, chemistry, and computer sciences are being applied. In Kiev, for example, a plan is being developed for the automatic control from a central console of the cascades of the huge reservoirs on the Dnepr. The joining of northern rivers and the waters of the Danube with the Dnepr is planned in the future. Implementation of the Dnepr program is being based on stringent scientific investigations and engineering and economic calculations. This is making it possible to allow fully for demands, to assess the rate and proportion of development of the national economy, and to forecast the latest possibilities for accelerating scientific and technological progress.

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## CLEANING UP THE ATMOSPHERE

Tashkent EKONOMIKA I ZHIZN' in Russian No 8, Aug 77 pp 65-68

[Article by L. Shabshay: "The Atmosphere Will Be Clean!"]

[Text] The development of industry and transportation is leading to changes in the make up of the planet's atmosphere and water basins, to disruptions in the natural progression of physical and chemical processes in the environment, its thermal and radiation balance. This has unfavorable socio-economic consequences. According to data of the Agency for the Environment losses from sickness tied to air pollution in the USA amount to 6 billion dollars annually. As a result of corrosion, material breakdown, vegetation loss and a decrease in agricultural yield, the USA annually sustains a 4.9 billion dollar loss. This is not surprising. After all, the USA's share of the world's pollution on the whole amounts to 40 percent.

A number of our republic's scientific institutions and enterprises are involved in carrying out the coordinated plan for 1976-1980. Among them is the Central Asian Branch of the All-Union Scientific Research Institute for Gas Utilization in the National Economy for the Underground Storage of Petroleum, Petroleum Products and Liquid Gas [SAF VNIIPromgaza].

We have not singled out this institute by accident. According to data of the Ninth World Energetics Congress, three-fourths of the sulfur dioxide and 40 percent of the nitrous oxides in the atmosphere are due to thermal power plants and heating and industrial boilers. The growth in the USSR's energy capacity over the next ten years will take place basically due to the construction of new and modernization of existing thermal power plants.

Scientists forecast that 80 percent of the world's electricity will be produced by power plants using organic fuels. We will add that with the growth of cities the number of boilers grows. And so that the accumulating situation becomes still clearer, we recall that the energy boilers of thermal power plants and heating and industrial boilers (located, as a rule, within the boundaries of a city) exhaust oxides, nitrogen, sulfur and carbon into the air as well as soot, ash particles and other substances harmful to health.

This situation determined our choice that the laboratories at the SAF VNII-promgaza conduct research namely on thermal power plants and boilers.

It must be noted that mankind has begun speaking out loudly about environmental protection in recent years, specific steps in this regard had been undertaken even earlier. Let us take, for example, smokestacks--the immutable fellow travelers of all enterprises that exhaust the residue of products of combustion into the air. In the first stage of industrial development this measure of thermal energy was sufficient. But first, in lowering the concentration of harmful substances being discarded into the atmosphere, due to their scattering, the smokestacks do not prevent the dispersal of these substances. And with increasing industrialization such a measure becomes almost useless. Secondly, since the world's power engineering is following a path of accumulating the sole power of boilers, there must be an increase in the height of the smokestacks. And this leads to sharp increases in construction costs. For example, the second stage smokestack of Syrdar'inskaya State Regional Electric Power Plant [GRES] costs almost five million rubles. And at the same time we will nevertheless breathe polluted air (in acceptable limits, of course) and toxic substances will settle on the meadows and fields, gardens and vineyards...

A more effective means of combatting pollution of the atmosphere is the installation of various ash trapping devices and filters. But in this instance the reason for the discharge of harmful substances into the air is not removed. Certainly more promising is not combatting the results of the combustion process but the study of the very process with the aim of eliminating its extremely negative effects.

It is just this path that was followed by the assistants at the laboratory of secondary energy resources and suppression of harmful discharges in exhaust gases at SAF VNIIpromgaza. They are studying the technology of fuel combustion in boilers in order to develop measures to remove or just decrease the very process of formation of harmful substances. This direction is the most difficult in that as yet there is no conclusive theory on the combustion process, and, consequently, on the formation of harmful substances. The difficulty from the very outset was that the country had several methods for determining the concentration of harmful substances (in particular, nitrous oxides) in the products of combustion. The assistants at this laboratory and the laboratory for the analysis of the products of combustion checked many existing methods to determine the concentration of nitrous oxides and improved upon the known photolorometric method. At the same time there was a decrease in the cost and labor consumption of the operations and the apparatus was simplified. The improved methods turned out to be so successful that it is being used alongside others by participating countries of the Council for Mutual Economic Assistance.

There was a need to begin from the end because a simple, inexpensive and precise instrument was needed to check the results of all subsequent work.

Not waiting for the development of a conclusive theory of combustion, the laboratory persistently works on creating effective methods to suppress harmful substances.

At first insidious traps awaited the scientists. For example, while increasing the surplus coefficient in boilers they were successful in decreasing the content of benzopyrene in escape gases, but there was a simultaneous increase in the concentration of nitrous oxides. It became clear that a very thorough method of suppressing one of the toxic substances does not guarantee (and at times the opposite is true) a decrease in the concentration of other harmful substances and that the solution to the problem is possible only using a complex approach. And therefore the "attack" on the toxic products of combustion is being waged in the laboratory on a wide front. Search for the most favorable parameters of toxic processes and designs for furnace burning devices is under way. There is study being done on the influence of introducing in the heating volume of water and water vapor, of various mineral additives. Methods are being researched for extracting harmful substances from fuel prior to combustion with the aim of using them in industrial technology.

This work is difficult. After all, every type of fuel (gas, oil, coal) and even diverse forms of one or the other type depending on area of extraction, requires a special approach. The diversity of the types of existing boilers and furnace burning devices imposes additional difficulties on the research work.

L. M. Tsirul'nikov, laboratory head and a candidate of engineering sciences, made an interesting declaration.

"The problem under study is so intricate that success is possible only based on profound theoretical developments. This is just the path we have selected. By virtue of its diversity the problem is not subject to modeling on experimental devices and we must (in the complete sense of this word) check out our conclusions on industrial boilers, of course, by guaranteeing reliable functioning of the equipment without lowering its operational indicators. It is understandable that this, in turn, requires that we develop thorough research methods. In this way we are making our contribution in the theory of combustion."

Frankly speaking, in proportion to the prolonged story of Lev Markovich, our doubts grew more and more. It is no secret that one of the main reasons slowing down scientific and technical progress in our country is the definitely imperfect tie of science to industry. Many good scientific ideas and developments in time became obsolete in that they do not go to conclusion from the path of "scientific research institute (design bureau higher institute of learning) to industry." How can the institute's workers succeed in going via this route when in certain instances a laboratory check is omitted. After all, the experiments are conducted on power units having a capacity of up to 300 megawatts. An emergency shutdown to the unit might affect the

stability of a small energy system and will probably yield large surpluses to the station.

To our question L. M. Tsirul'nikov responds: "Let's be more specific. Basically we do not reject laboratory testing and certain particular assignments we check out in just this way. But considering that under laboratory and test bench conditions it is difficult for us to adhere to all principles of modeling. Energetic research on our problem can only be carried out on operational industrial equipment. What will allow us to penetrate this wall of distrust? First of all there is confidence in the correctness of the working hypothesis. So that it will be vital what is necessary is faith in the theoretical points of departure and thorough scientific analysis of them. The researcher must enlist all his own experience, all his learning, and even intuition.

"Moreover," continues Lev Markovich, "we must even discuss this as engineers knowing these needs, the narrow places of production and the proposed prescriptions for the elimination of such places. From my own experience I know it is difficult to meet conservative production workers, and there are scientists (working in applied science) isolated from production needs and therefore not capable of overcoming the 'science--production' barrier."

It is interesting that a majority of the laboratory assistants also think along these lines. And it is impossible not to agree with Lev Markovich that just close mutual ties between the scientists and production workers is one of the main conditions for success. But this is only one of them. Uninterrupted, the effective chain of "science--production" will work only when production workers find themselves in such conditions in which they will become interested in the use of the latest achievements of science. At only this time will there be a guarantee of fulfilling the most important social task--the acceleration of scientific and technological progress in the country.

But let us return to matters of the laboratory.

Experience has shown that difficult problems are more successfully solved where a complex approach to their solution is provided. Such a complex approach requires the combined efforts of researchers from various scientific professions, not a simple arithmetic combination of efforts, but one that is harmonious and integrated. Success is difficult to achieve, at times impossible, if a collective is divided into basic performers and auxiliary performers like in a so-called "subservient capacity." Only a universal interest in success that is morally and physically stimulated and an atmosphere of enthusiasm created by a proportionate but equal participation in the affairs of all assistants establishes a collective in which the limits are wiped away among the various professions to overcome the caste system, and where knowledge is mutually enriched and synthesized. Just such a collective was set up at the laboratory for secondary energy resources and suppression of the harmful substances in escape gases. It unifies thermal energetics and automation, chemistry and mechanics. The complexity of

research is ensured by the fact that the laboratory collaborates with the Uzbek Scientific Research Institute for Oncology and Radiology, with the Central Asian Department of the All-Union State Institute for the Planning of Electrical Equipment for Heat Engineering Structures [Teploelektroproyekt], the All-Union Thermo Engineering Institute imeni F. E. Dzerzhinskiy, the Tashkent Polytechnic Institute, the Leningrad Polytechnic Institute imeni G. M. Krzhizhanovskiy and other scientific institutions. The laboratory speaks fondly of the Uzbek SSR Ministry of Power Engineering and Electrification which is giving the "green light" to go ahead to the associates at the republic's thermal stations.

It would be possible to cite a number of published monographs and articles that have been patented for inventions (at times entire institutes cannot boast of such a number). We do not do this deliberately because the problem is still far from completely solved. One of the leading researchers, V. G. Konyukhov, thinks that it will be possible to speak about a conclusive solution only after the establishment of an automated system to determine the concentration of toxic substances in escape gases with the simultaneous regulation of the combustion process keeping discards to a minimum.

It should be added that the preliminary result of a prolonged intricate experiment on one of the boilers at the Tashkent GRES was the output of the first recommendations on optimization of the furnace system allowing for improved technical and economic work indicators for the unit with a simultaneous decrease of harmful substances discharged into the atmosphere.

Its results might be applied at a number of similar boilers at stations in Fergana, Navoi and elsewhere. The complex research conducted by the laboratory assistants on 300 megawatt power plants located at the Ural's Irikliinskaya GRES permitted a decrease in the concentration of nitrous oxides in escape gases by two times, and carcinogens by 3-5 times. Plans call for carrying out the same work at monotypic units at the Syrdar'inskaya GRES. The republic's ministry of power engineering and electrification authorized Teploelektroproyekt with the collaboration of SAF VNIIPromgaza to plan a technological scheme to introduce a mineral additive developed at the institute into fuel for the black oil industry of the Tashkent and Syrdar'inskaya GRES.

Out last meeting with L. M. Tsirul'nikov was after his return from Leningrad where he participated in the work of the All-Union Scientific and Technological Meeting on the theme "Increased Quality of Fuel Combustion and the Protection of the Air Basin from Pollution from Harmful Discards from Heat and Electric Power Stations." Ahead is a trip to Minsk. Within the framework of the European Economic Commission an international symposium will take place on the gas industry and the environment. The laboratory will present two reports at the symposium. This is in recognition for its worthy contribution in the overall struggle of scientists for a clean atmosphere.

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## ECONOMIC, ECOLOGICAL ADVANTAGES OF RECYCLING

Moscow MATERIAL'NO-TEKHNICHESKOYE SNABZHENIYE in Russian No 8, Aug 77  
pp 58-63

[Article by S. Dudenkov, doctor of technical sciences: "Effect--Economic and Ecological"]

[Text] Boisterous development of science and technology, rapid growth of the volumes of production inevitably lead to increased consumption of natural resources and intensive negative effect of human management on the environment. During the last two centuries, and especially within the last decades, man's interference with the natural order was carried out at an unprecedented rate.

These days 100 billion tons of various minerals are being extracted from the earth annually, and by the year 2,000 total raw materials extraction will increase 6 times. In connection with this processes of global redistribution of chemical elements are taking place, landscape, hydrogeological, and climatic changes are occurring, and the cycle of basic organ-forming elements, such as carbon, nitrogen, and phosphorus, and the microelemental composition of the earth's core, formed by millennia, are being upset.

Unforeseen changes in the atmosphere and climate of the earth are caused by ever-increasing quantities of burned fuel and freely floating in the atmosphere solid particles and dust. According to some estimates, 20 million tons of solid particles get into the atmosphere annually. And if one takes into account that they remain in the atmosphere for quite a long time, the total quantity of solid particles in the atmosphere increases annually by approximately 2 million tons. World ocean, covering 70 percent of the earth's surface, is also under the threat of pollution. North Sea and the northern part of the Atlantic Ocean are called the "sewer" of Europe today. Sewage reduces the oxygen content of water and poses a threat to the existence of aquatic life. Moreover, man artificially creates chemical compounds not encountered in nature, some of which have a definite effect on natural processes. One of the factors which have a detrimental effect on the environment is production and consumption waste.

In recent years the questions of environmental protection, preservation of primary raw materials resources, and utilization of secondary resources are viewed as one problem.

The advantages of using secondary raw materials are not limited to the economy of primary resource materials. Thus, when 1,000 tons of steel blanks are produced from secondary resources, there is an economy of 74 percent power and 76 percent high-quality water, and atmospheric pollution is reduced 86 percent in comparison with production of the same quantity of blanks from primary resources. Obtaining aluminum and copper from ore is 10-15 times more power-intensive than obtaining them from scrap.

Experience shows that production on the basis of secondary resources entails less negative effect on the environment than equivalent production on the basis of primary materials, although in a number of cases it is more expensive. Thus, with the production of 100 tons of steel from scrap atmospheric and water pollution is lowered respectively 6.5 and 4 times, and the amount of solid waste which is formed is reduced 16 times. When 1,000,000 tons of wastepaper are used in the production of paper products, waste is reduced by almost 30,000 tons.

Utilization of waste to a considerable degree solves the problem of its distribution, and the use of waste in places where it originates by way of creating wasteless technologies makes it possible to safely protect the environment and reduce the costs of collection, transportation, and storage.

Waste utilization has become one of the most important problems for all industrialized countries. Taking into account further development of production, it is already now necessary to take extreme measures both on the level of each government and on the intergovernmental scale for the purposes of environmental protection, because economic expediency of production waste utilization already cannot be the sole criterion of evaluation.

Within the past few years our country has conducted a number of important measures, directed toward improving the collection and utilization of secondary resources in the national economy. During the years of the Ninth Five-Year Plan more than 20 million tons of various types of secondary resources were collected and utilized in industry, including 9 million tons of wastepaper, 2.8 million tons of secondary textile materials, 2 million tons of glass, 1.5 million tons of used tires, 1.37 billion rubles' worth of soda ash, and 627,000 tons of synthetic rubber. From all this, goods for production and technical purposes and consumer goods worth 4.66 billion rubles were manufactured.

Some 203 million tons of ferrous metal scrap was procured. The collection of nonferrous metal scrap and waste was improved. In 1975 alone 1,459,000 tons of them were collected.

In the Ninth Five-Year Plan the material and technical basis of production-procurement organizations and processing enterprises was considerably strengthened, their capacities increased 8 and 3 times, respectively. A number of organizational measures were accomplished. In particular, good results in the field of wastepaper procurement were shown by a competition of Pioneers and schoolchildren under the motto "One Million for Our Motherland." During the 1975/76 school year 197,000 tons of wastepaper were collected by the students. Despite isolated shortcomings, the experiment of collecting wastepaper in exchange for light literature has fully justified itself.

At the same time, an analysis of the state of secondary resources utilization in the USSR national economy still shows an insufficient level of their procurement and recycling. Thus, in 1976 in respect to resources which could be collected it constituted 54.3 percent for secondary textile materials, 68.3 percent for wastepaper, 63.4 percent for glass, 54.1 percent for used tires, and nearly 8 percent for secondary polymeric materials. At the same time the volume of procurement of secondary resources in 1976 exceeded the existing capacities for their recycling. For this reason the procurement organizations were forced to slow down, for example, on the collection of wastepaper, because constant surplus of it in the warehouses constituted nearly 100,000 tons.

Every year tens and hundreds of thousands of tons of waste, incidental, and secondary products are formed at the enterprises of the chemical, mechanical-rubber, petrochemical, and other industries.

In 1975 out of 193 million tons of solid and liquid secondary material resources of the chemical industry only 65.5 million tons (34 percent) were utilized. But even this had already ensured an economy of 20.3 million tons of primary raw materials and materials.

The level of utilization of ash and slag of electric power stations, of ferroalloy and steel-smelting slag, which contain more than 20 percent metal and ligneous waste, is insufficient.

The national economic effect from the utilization of only the increment to the ligneous waste formed during the years 1975-1980 (11 million cubic meters) could constitute 157.8 million rubles, or 14 rubles and 4 kopecks for 1 cubic meter, without counting the ecological and social effect from preserving the growing forest.

Production of items from wood waste in the Komi, Mari, Mordovian ASSR, in Kirovskaya, Gor'kovskaya, Tul'skaya, Ivanovskaya, and Chelyabinskaya Oblasts, where the timber and wood processing industry is developed, during the years of the Ninth Five-Year Plan was not expanded, and in the Karelian ASSR, Altayskiy and Krasnodarskiy Krays, and Sverdlovskaya Oblast it was even reduced. And this, despite the fact that the cost of goods received from 1,000 square meters of wood, depending on the structure of resources consumption and taking into account the use of waste, constitutes about 17,000 rubles.

At the same time expenses, connected with the organization of dumps, incinerators, and neutralizers for waste and incidental products, express themselves in hundreds of millions of rubles. Coal-separating factories and mines annually ship to the dumps 170 million tons of waste. For its storage 40-50 million rubles are spent annually, whereas no less than 1 percent is used.

In the dumps of enterprises of the mining and metallurgical industry there is an accumulation of hundreds of millions of cubic meters of rock and slag waste which could be successfully used in the production of construction materials. The cost of a cubic meter of crushed stone from waste is two to two and a half times cheaper, and capital investment is almost three times lower, than at specialized enterprises.

Industrial and agricultural waste is a good raw material for the manufacture of consumer goods. However, enterprises of local industry are involving these resources in production poorly. In 1976 from this waste 835 million rubles' worth of products and household goods were manufactured, which constitutes only 9.2 percent of the total volume of output.

Local industry enterprises are not using enough of scrap metal. For example, during the years of the Ninth Five-Year Plan the recycling of scrap metal in the RSFSR and the Ukrainian SSR was reduced in comparison with the Eighth Five-Year Plan. The volume of output of items from scrap metal at the enterprises of the Ministries of Local Industry in the Kirgiz SSR and the Tadzhik SSR is extremely insignificant.

Domestic waste is a problem of special importance. In 1975 alone there were nearly 30 million tons of it in the USSR, and 12,000 hectares of land were needed to bury it. By 1980 this waste will increase to 40 million tons a year. Domestic waste contains up to 80 percent of valuable components which are suitable for recycling. It is a valuable raw material for albuminous fodder for cattle and also for compost which can be used successfully as fertilizer in the fields of the country. One can derive from domestic waste nearly 95 percent metal, 75 percent wastepaper, 50 percent polymeric materials and glass, 83 percent of organic substance, the cost of which in 1975 alone constituted almost 355 million rubles, and by 1980 this amount will reach 550-580 million rubles.

According to available estimates, by extracting 70 percent of metal, paper, textile, and polymeric materials which get into the trash in Moscow alone, one can get almost 20 million rubles' worth of secondary materials.

In many cities of the country construction of refuse-incinerating plants has been started. However, it would have been much more profitable to build not refuse-destroying, but refuse-recycling plants. The technology of domestic waste recycling with extraction of valuable components is being currently developed at VIVR [All-Union Institute of Secondary Resources].

Calculations show that under the condition of centralized recycling at large enterprises, the degree of utilization of domestic waste can reach 90-94 percent. This is a very high figure, which no country in the world managed to reach today. But it could become a reality in our country, if a certain complex of organizational-technical measures were carried out.

In the Ninth Five-Year Plan USSR Gossnab carried out definite measures in respect to the strengthening of the material basis. Production-procurement enterprises for the collection of secondary resources with a total capacity of more than 230,000 tons were built and put in operation in Khabarovsk, Krasnoyarsk, Kemerovo, Biysk, Ufa, Smolensk, Saratov, Pavlodar, and other cities. New specialized factories for the processing and recycling of secondary resources were built and the existing ones reconstructed in Moscow, Leningrad, Kishinev, Novosibirsk, Kalinin, and other cities.

As a result the capacities of these enterprises have increased by 100,000 tons. Centers for the procurement and processing of wastepaper with a capacity of nearly 85,000 tons a year were mechanized in Sverdlovsk, Chelyabinsk, Leningrad, Moscow; production buildings of light metal construction with a total area of nearly 90,000 square meters were put in operation.

In order to equip the newly built and technically reequip the existing enterprises nearly 29 highly productive complex presses, more than 250 presses for pre-packaging the resources, and other equipment were allocated and installed which made it possible to considerably improve the packing of raw materials, the use of cargo hoisting ability of cars and automotive transport, and reduce in the shipment of wastepaper the need for cars by 10.3 percent and the need for motor vehicles by 8.5 percent. More than 2,800 motor vehicles, more than 550 tractors, nearly 800 tractor trailers, and 160 automatic loaders were allocated for the procurement and transportation of secondary resources.

In 1976 enterprises of "Vtorsyr'ye" [Administration for the Procurement and Processing of Secondary Resources] have received a large amount of new equipment: aggregates for the production of nonwoven materials (AIN), floor covering (AIK), and for the processing of raw materials and finishing of finished products, and so on.

In the Tenth Five-Year Plan industry faces the tasks of involving diverse secondary resources in recycling on a larger scale. In particular, USSR Gossnab expects to bring the utilization of wastepaper up to 3 million as against 2.1 million tons in 1975. For this purpose, construction is planned of enterprises for the production of cardboard and paper from wastepaper with a total capacity of nearly 1 million tons a year, including 400,000 to 470,000 tons of tare and box cardboard, 400,000 tons of wrapping paper, 150,000 tons of different kinds of sanitary paper, and 50,000-60,000 tons of various sorts of printing paper.

Toward the end of the current five-year plan the utilization of secondary textile materials will increase to 737,000 tons.

The utilization of secondary textile materials is realized mainly through the production of nonwoven materials and fabrics, including 30 million square meters of soundproof, heat-insulating padding for linoleum, 135 million square meters of nonwoven fabrics for production and technical purposes, 15 million square meters of floor covering, 30 million square meters of nonwoven cleaning cloth, and 20 million square meters of wadding.

At the present time new types of textile fabrics are being developed from secondary resources. For their manufacture it is expected to use a mixture of fibers with a maximum replacement in it of high-quality chemical and natural fibers of restored wool with waste from cotton production. By virtue of this, it is planned to reduce their production cost by more than 220 million rubles. From primary resources economized during the years 1976-1980 it is planned to manufacture items for production and technical purposes and consumer goods to a total of more than 1.4 billion rubles.

Besides that, utilization of secondary polymeric materials will increase to 43,000 tons in 1980, and to 200,000 tons by 1985 (70 percent of the possible level of collection of secondary polymeric materials) as compared to 18,000 tons in 1975. In order to do this, construction of enterprises for the processing of secondary polymeric materials with a total capacity of 200,000 tons of goods a year should be completed before 1985.

However, in a number of industries increased utilization of industrial waste, substitution of primary resources with secondary resources, is not being planned. In spite of the available opportunities to considerably increase production of goods from local raw materials and waste, gosplans and ministries of local industry of some Union republics have planned almost the same rate of growth for production of these goods as for production of goods from strictly controlled reserve materials (for example, in the Kazakh, Latvian, Tadzhik, Estonian SSR and other republics).

Utilization of secondary resources in the volumes outlined will make it possible in the Tenth Five-Year Plan to produce goods for production and technical purposes and consumer goods to a total of 6.5 billion rubles, and in the Eleventh Five-Year Plan, to a total of approximately 9 billion rubles. At the same time, savings in the national economy from the utilization of secondary resources will constitute more than 400 million rubles in 1980, and nearly 550 million rubles in 1985, not counting the huge ecological and social effect.

In order to realize the outlined program for improving the utilization of secondary material resources, it is necessary to resolve a complex of organizational, technical, and social problems. First of all it is necessary to eliminate both in individuals and in the departments the psychological barrier in respect to this important issue.

Lately, USSR Gosstnab and its organs have been receiving hundreds of letters attesting to the careless attitude toward secondary resources. Lots of recommendations to improve their collection are given in them. However, when residential housing is designed, places for keeping waste are planned: neither in the apartment, nor in the hallway, nor in the area of trash collection. In the proposed microrayons all domestic services are anticipated, except collection centers for secondary resources. At best, places for their construction are allocated on the outskirts.

There are also many other reasons for the unsatisfactory utilization of secondary resources.

Insufficient interest of ministries and departments in utilizing secondary resources is caused by the absence of an effective system of economic stimulus and the imperfection of pricing. Thus, in the Tenth Five-Year Plan the Ministry of Pulp and Paper Industry, along with a 21.6 percent growth of paper and cardboard output, anticipates wastepaper utilization on the level of 1975. Secondary resources are poorly involved in production in the Ministry of Chemical Industry, in the USSR Ministry of Petroleum Refining and Petrochemical Industry, and in the USSR Ministry of Light Industry.

It is expedient to introduce statistical records of the availability, formation, and utilization of incidental products and waste from production and consumption.

Ever-increasing growth of the volumes of production and consumption of material resources raises the problem of complex utilization of waste. However, it is impossible to resolve it with half measures. Decisions of the 25th CPSU Congress demand development and realization of measures on an All-Union scale.

It seems expedient to draw up a complex plan which would anticipate the volumes of procurement and recycling of secondary resources, output of goods from waste, as well as volumes of allocated for this purpose capital investment, equipment, transport means, and so forth. Besides, capital investment should be increased for the reconstruction of the existing and augmentation of new capacities for recycling secondary resources in diverse industries of the national economy, and industrial scientific-research institutes should be encouraged to participate more actively in the development of modern types of equipment and improved technological processes, ensuring reduction of losses and production waste, and also of measures in respect to a more effective utilization of waste and secondary products which are being formed.

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## INTERNATIONAL AFFAIRS

### SALTING UP OF RHINE BEFORE ROTTERDAM COURT

Rotterdam NRC HANDELSBLAD in Dutch 5 Nov 77 p 7

[Article by F. G. de Ruiter: "Lawsuit Against Salting Up of Rhine Is Progressing"]

[Text] The lawsuit which some growers from Westland and the Rhinewater foundation have instituted against the French potassium mines this week clearly progressed before the Rotterdam court. The last few months the threat of a new lengthy delay was in the air because of the request of the potassium mines to summon 18 co-polluters of Rhine water. That request in fact has been withdrawn, since it appeared that the subpoena had been misread, and with it the way has been opened for dealing with the matter at issue. Finally, after three full years.

It was never disputed by anyone that the potassium mines in Alsace are among the biggest West European polluters. Annually they discharge over 7 million tons of common salt in the Rhine, that is 40 percent of the total salt concentration this river carries. Westland growers use polder-water originating from the Rhine to water their crops and thus they experience financial disadvantage from the salting up. They have to install and maintain expensive installations to make sure their horticultural products remain marketable. Per firm this would annually amount to a loss of between 15,000 and 20,000 guilders.

This loss cannot be blamed only on the potassium mines. The German soda industry and coal mines also discharge considerable quantities of salt in the Rhine. But what they individually contribute to the salting up is not comparable to the share (40 percent) of that one French (state) firm. Hence the growers directed their action in the first instance against the potassium mines. They ask the court to condemn the discharging of salt in Alsace as an illegal action and demand restitution of the damage the potassium mines cause them, thus 40 percent of the total.

This is what is legally called the "principal case." The past few years however that principal case has continually been pushed to the background through a question of procedure; the question of whether the Dutch judge is indeed qualified to deal with the suit. Ultimately the question was

answered affirmatively by the highest court and thus the matter could be taken up again in Rotterdam. Now that the danger of a new lengthy delay has been averted, finally the essential questions will come up for discussion.

But there is something else. On 3 December 1976 the states bordering the Rhine, including the Netherlands, made a treaty which is to restrict the salting. This agreement, signed in Bonn, concentrates on the potassium mines which are required to decrease their salt discharges. The question could come up whether a civil action like that of the Westland growers is not superfluous in light of the international treaty. The Dutch lawyer for the potassium mines, Mr C. D. van Boeschoten, hinted at that still this week before the Rotterdam court. One may presume that he will give this aspect full emphasis if the case truly starts.

Also his opposition counsel, Mr J. R. Voute, representing the growers and the Rhinewater foundation, this week brought up for discussion Bonn's salt treaty, but in a negative sense. He expected little or no good from it; the effect of the steps to be taken by the potassium mines would be negligible.

There is plenty of reason to share Mr Voute's scepticism, although in all honesty it should be pointed out that his words put forth a suggestion which does not completely tally with the facts.

What is the case? According to the treaty of Bonn, the potassium mines in the long run had to decrease their salt discharges by 60 kilos of chloride ions per second, which converted amounts to 100 kilos of common salt per second. That is less than half of the total discharge in Alsace. In order to keep back that superfluous salt, a system of underground storage was chosen. The intention is to inject it into a 1500-meter deep, porous stratum near the mines.

That does not happen all at once however, but in phases. The first phase comprises only 33 kilos of salt per second. Mr Voute limited himself before the Rotterdam court to that first phase and thereby created the impression that the discharge of the potassium mines would decrease by only a few percent, thus negligibly.

It would have been better to refer to the entire program, but then simultaneously to point out a very dubious factor, namely that of the time periods. According to the treaty the first phase (thus underground storage of 33 kilos of salt per second) must start "as soon as possible, but at the latest within 18 months after the agreement becomes effective." It is not yet known when the treaty will become effective. In any event, it first has to be ratified by all Rhine nations. Supposing that happens within a short time, it would still be mid-1978 before the treaty acquires legal power. That would mean that France in the extreme case would start only in 1980 with the first phase.

Fortunately that won't happen, at least if France sticks to its word. The promise was to start at the beginning of 1979, thus a year earlier, with the first phase. Mr Van Boeschoten was able to confirm that last Monday speaking for the mines. "As of 31 December 1978 the installations must become operative," he said before the court.

But the subsequent phases are still up in the air. In Bonn the intention was expressed to put away the full 100 kilos of salt in the porous stratum by no later than 1 January 1980 -- taking into account the results obtained "during the first phase," as is added in the treaty. The entire program is thus made dependent upon the experiences the French gain after 1 January 1979 with the injection system and that period is much too short to achieve the projected date. Even if the French try their utmost, which is doubtful, based on experiences in the past.

For that matter, a proviso was put into the treaty: there has to be agreement on the "technical stipulations of the project and the financing of the costs connected with it." Moreover, it appears that resistance at the local level is arising in Alsace against the injection method. Affecting of the ground water which serves as drinking water is feared.

All of this makes it entirely unrealistic to presume that the salt discharges will decrease by 100 kilos per second no later than 1 January 1980. A prediction stretching it to 1983 or 1984 seems much more likely. Seen in that light, the lawsuit of the Westland growers continues to be extremely sensible.

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SWEDEN

#### TANKER SPILL BRINGS DISASTER TO STOCKHOLM ARCHIPELAGO

Stockholm SVENSKA DAGBLADET in Swedish 20 Nov 77 p 4

[Article by Lennart Lundegårdh]

[Text] The oil has killed practically all animal life in the belts of bladder wrack along extensive stretches of the Toro and Liso coast opposite Trosa. Scientists have already established that as one effect of the recent Russian tanker spill. The phytoplankton and zooplankton that are basic to life have also been affected.

At the Asko Laboratory, Stockholm University's marine biological station located practically at the site of the spill, a tremendous amount of research material is now being collected.

As soon as the accident became known, all ordinary work at the laboratory came to a halt and the entire staff--25 persons in all--was put to work recording what the oil spill was doing to living things.

The pace has slowed down now, but seven people are still working to collect, sort, and label the samples before storing them in freezers for future analysis.

Olle Linden is employed by the Research Institute for Water and Air Protection, but he has been borrowed to head up the studies following the Tsesis accident. He is an expert on the effects of oil spills.

He says, "The running aground [of the Tsesis] is tragic for man and nature, but at the same time it provides a unique opportunity to make a scientific study of an oil spill's effects on the environment."

#### Obscure Relationships

The Asko Laboratory has been in operation since 1961 and possesses an extraordinary amount of material with which to make comparisons, part of it having been collected precisely in the area that has now been hit with a sizable oil spill.

Olle Linden says, "This gives us a tremendous chance to clear up relationships and effects that have been obscure until now."

The acute first phase of the oil spill is over now, although there is still a quantity of oil among the reeds in the bays.

But although the scientists have scarcely begun to evaluate the material they have collected so far, they can already see that some laboratory results are now--virtually for the first time--being verified by actual experience.

This applies first and foremost to the effect on phytoplankton and zooplankton, which are themselves the basis for life in the sea.

#### Fauna Swept Away

Olle Linden says, "In the case of the phytoplankton, which carries out the vital photosynthesis process in the water and converts solar energy into forms usable by living things, we were able to note an immediate drop in activity."

Strangely, the amount of phytoplankton later increased. The scientists cannot explain why for the moment. One reason may be that numbers of zooplankton (which feed on phytoplankton) were poisoned by the oil and died.

The study program also calls for a survey of what is happening now within the stricken seashore zones. Among other things, there are belts of bladder wrack which harbor abundant and vitally important animal life.

Olle Linden says, "It is as though all the fauna had been swept away, with the exception of acorn barnacles and a few sea mussels. The reason they are still there is that they are literally stuck there. It will undoubtedly be many years before order is restored."

#### Aerial Photography

It is not yet known whether the bladder wrack has also been poisoned. It is hoped that aerial photography will eventually be able to clear up this point.

Samples are now being taken regularly from the sea bottom as well. That is where the oil settles after it is atomized in the water. The effect depends on how far down the oil penetrates.

Olle Linden says, "If it reaches levels in the bottom sediment where oxygen is not present, it will still be there decades from now." Linden has already discovered that bivalves living on the sea bottom have been affected.

Fishkills (bullheads and Baltic herring) have been noted. Sea birds have had to be killed, and customs officers still find it necessary occasionally to use their shotguns. But so far the number of birds affected has been relatively small.

Olle Linden says, "For that we can thank the swift and successful cleanup operation in the area."

#### More Money Requested

The bullheads spawn around Christmas time, and in the spring it is the turn of the Baltic herring. Special studies of the area's spawning grounds are planned. No one knows how great the effect has been on the fish now living in the bays.

Nor does anyone know how many fish there are. But a nearby bay was studied a couple of winters ago using echo sounders and fish sampling, and it was found to contain 13,000 tons of Baltic herring!

It is fortunate that the Tsesis was not carrying diesel oil instead of the heavy fuel oil that has now leaked out (and approximately 300 to 500 tons of which was able to disperse in the water before the cleanup crews got to it). Otherwise the toxic effect would have been even worse.

So far the Asko Laboratory has received 150,000 kronor from Customs and the National Environment Protection Board for its present study program. Now it is asking the National Environment Protection Board for more money so that it can take advantage of the opportunity to gather extraordinary scientific data on which practical experience can be built.

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## TURKEY

### POLLUTION CONTROL MEASURES SET DOWN IN PROTOCOL

Istanbul HURRIYET in Turkish 28 Nov 77 pp 6. 7

[Text] Ankara--It has been announced that air pollution in Ankara is rapidly increasing and that the capital is entering a danger zone. Smoke and sulphur-dioxide in the air, which imperil human health and gradually open the way to widespread deaths, have shown a large increase in comparison with previous years. In this season of the year, during which furnaces are not operating at full capacity, air contamination has reached the danger zone. Due to the air pollution's having reached in this season a level four to five times greater than the levels accepted by the World Health Organization, authorities have prepared a package of measures. The application of the package of measures, which call for the addition of a special additive to fuel oil and a ban on bringing fuel oil and coal with excessive sulphur into the capital, will bring about a 60 percent decrease in the danger.

A triple protocol has been drawn up between the Ministry of Health and Social Welfare and the Ministry of Energy and Natural Resources. In the protocol, prepared by the director of the Office of Energy, the chairman of the Committee on Science, and a representative of the Ministry of Health, the most important measures to be taken against air pollution are as follows:

"Coal containing more than 4 percent sulphur will not be brought into Ankara. Furthermore, permission to bring fuel oil containing more than 5 percent sulphur into the capital will be withheld. A special additive will be placed in fuel oil."

It has been learned that the special additive to be placed in fuel oil has been prepared by the Petrol Office, and that this practice was developed in Europe. The special additive will insure a 5 percent savings in the use of fuel oil. The additive will reduce sulphur-dioxide by 25 percent and smoke by 75 percent. At the same time, a savings of 97 lira per ton of fuel oil will be achieved.

## Pollution Above Normal for Season

The package of measures, having been deemed suitable by the Ministry of Health, was then presented to the Ministry of Energy and Natural Resources. Doctor Abdullah Ileri, director of air pollution studies at Ankara's Refik Saydam Institute of Hygiene, in an interview given to HURRIYET on the subject, stated that even in this season, when furnaces are burning only a quarter of the time, air pollution is still four to five times higher than the levels accepted by the World Health Organization.

Ileri said that the package of measures will reduce pollution by 60 percent, and that Ankara should expect serious dangers if they are not instituted.

Ileri, explaining that 75 percent of the air pollution is caused by improper combustion and fuels, stated that the Ministry of Health will take measures by degrees if the package of measures is not instituted.

According to Dr Abdullah Ileri, the measures to be taken, in proportion to the increase in air pollution, are as follows:

- 1) In the event of the level of sulphur-dioxide and smoke reaching 500 milligrams per cubic meter of air, furnaces will be operated at only 50 percent capacity.
- 2) Should the sulphur-dioxide and smoke in the air reach a level of 750 milligrams per cubic meter, motor vehicles will not be allowed to enter the areas of danger, and furnaces will be operated only in the mornings and in the evenings.
- 3) Should sulphur-dioxide and smoke reach a thousand milligrams, places of public assembly will be closed. The public will be enjoined from leaving their homes. Meanwhile, an attempt will be made to provide everyone with ammonia for their homes, since it has been established that ammonia has a neutralizing effect on sulphur-dioxide.
- 4) In the event that sulphur-dioxide and smoke reach 1500 milligrams per cubic meter of air, substantial numbers of deaths may begin. For this reason, the evacuation of the capital will be carried out.

Abdullah Ileri stated that the average level of sulphur-dioxide and smoke encountered in this season is 300-350 milligrams per cubic meter, and that this level may rise during the winter months. Ileri said that it is for this reason that the measures in question, prepared to protect the public from danger, be instituted immediately.

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## TURKEY

### AIR POLLUTION CONTINUES TO BE PRESSING URBAN PROBLEM

Istanbul MILLIYET in Turkish 26 Nov 77 p 8

[Text] Over the holidays, the air contamination in Ankara was 4.5 times the maximum level for smoke set by the World Health Organization and 2.5 times the level for sulphur-dioxide.

According to information received from the Air Pollution Research Laboratory of the Ministry of Health and Social Welfare's School of Hygiene, the amount of sulphur-dioxide in a cubic meter of air in Ankara has risen to 350 micrograms, while the amount of smoke has reached 325 micrograms.

Sinasi Ozdenoglu, assistant general director of the Turkish Association to Fight Air Pollution, has explained that, in spite of various warnings and appeals in this matter since 1961, no one has been found who can come to grips with the situation. "Ankara is maintaining a strange silence on this matter. Last year, there were sudden deaths in the city. Even though it was known that these were caused by acute atmospheric contamination, announcement of this fact was avoided," he said. Ozdenoglu said that the studies on smokeless fuel begun in 1974 were not able to be completed, that Ankara would require 700,000 tons annually of coal cleansed of gases, and that there was thus a need for three factories to produce this sort of coke.

### Women Becoming Ugly

Ozdenoglu, saying that "Ankara's air is making our women ugly," stated that it is now difficult to find a beautiful woman in Ankara, which was once known as a city of beautiful women; that the air pollution is upsetting people's metabolism; that body cells are unable to carry out their normal processes of respiration; and that this hinders the oxidation of carbohydrates, consequently leading to obesity and skin problems. Ozdenoglu also added that the healthy development of a child in its mother's womb requires that it not take in toxic substances, yet there are 29 harmful gases to be found in Ankara's air.

In addition, Dr Ziya Durmus, member of the Higher Council on Health, has said that "The health of future generations and the healthy development of mother and child are dependent upon their not taking toxic substances into their bodies and upon their receiving sufficient oxygen: that is to say, fresh air."

#### Rapid Action Necessary

The problem has finally reached dimensions which demand that rapid and realistic action be taken, according to the experts, who say that, although there is 1.4 gram per billion of the poisonous gas known as selenium in a cubic meter of air in the American city of Boston, this figure is 116 grams in Ankara.

Sinasi Ozdenoglu, complaining that, although this problem is being solved in Western cities, we have never adopted a serious approach, said "In the 1940's, Ismet Inonu, the prime minister at the time, said that our foreign policy was as clear and as open as the air of Ankara. But today our cities, with Ankara first, followed by Istanbul, Kocaeli, Adana, Konya and Izmir, as well as our other cities, are faced by an air pollution that is gradually becoming an everyday occurrence."

Ozdenoglu, stating that air pollution has become a serious problem in Istanbul, said "In the air of Istanbul there are lead compounds. In some parts of the city, arsenic reaches a level of from 10 parts per thousand to 995 parts per thousand. In the measurements which have been taken, arsenic is 400 per thousand at Taksim, Besiktas and Karkoy, 350 per thousand at Aksaray, and the average at Uskudar and Kadikoy is around 700 per thousand."

On the other hand, certain measures, to be instituted in extraordinary situations of air pollution, have been developed by the Ministry of Health and Social Welfare. In case the smoke and sulphur-dioxide in a cubic meter of air should reach 500 micrograms, it will be necessary to apply these measures.

Among these measures are included: using furnaces at a reduced level; restriction in daytime working hours in nonessential situations; the prohibition of smoking in closed areas; and a ban on burning garbage, leaves, and similar material.

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TURKEY

BRIEFS

EROSION LOSS--Earth science professor and Assistant Dean of the Agriculture Faculty at Ataturk University, Dr Hayati Celebi, has asserted that nearly 440 million tons of earth are lost from the Turkish land mass to the sea per year due to erosion. If this soil was to be spread out at a thickness of 20 centimeters, an area the size of the island of Cyprus would be lost each year. Professor Celebi contends that 17 million hectares (1 hectare = approximately 2 1/2 acres) of Turkish soil are subject to serious erosion at the present time. This erosion process is gradually reducing the amount of arable soil within the country and the seriousness of this threat is brought into focus, in Professor Celebi's estimation, when one considers the balance which must be struck between production and increased population within the near future. [Excerpts] [Istanbul AKSAM in Turkish 14 Nov 77 pp 1, 7]

GOLDEN HORN MASTER PLAN--A three volume study entitled "The Golden Horn Master Plan," prepared by Bogazici University at the request of the Ministry of Public Works, has recently been completed. The master plan, which contains detailed information concerning coastal areas, warehouse transport facilities, industrial installations, local land and sea transportation, air pollution, water facilities, drainage and water pollution in the Golden Horn and the surrounding area, was given to the Ministry of Public Works by Professor Doctor Semih Tezcan. [Text] [Istanbul HURRIYET in Turkish 7 Dec 77 p 3]

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